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IMPLEMENTATION OF EFFECTIVE INTELLECTUAL PROPERTY (IP) MANAGEMENTFRAMEWORK BY PUBLICLY FINANCED RESEARCH AND ACADEMIC INSTITUTIONS IN GHANA

BY

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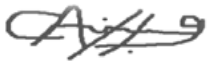
Abstract

Awareness is currently going on in most public and private academic institutions and other publicly financed research institutions in developing countries including Ghana to implement an effective Intellectual Property (IP) management framework with special focus on Intellectual Property Rights (IPRs) protection to enhance security of the research and development outputs. Technology Transfer Offices (TTOs) in publicly financed and private institutions are supposed to come out with mechanisms or policies that are mostly applied consciously to manage the generation of IPs, the rights of ownership, exploitation of rights, rights protection, enforcement and output commercialization. The implementation of IP management system requires a clear policy and legislative backing as well as an efficient administration and enforcement structure. This study research is a qualitative research which is based on pure and applied research methodology classified by purpose. It is an inductive research approach which is embodied as a pure or fundamental research undertaken for an increase in knowledge. The research is conducted on publicly-financed research and academic institutions located in three regional capital cities in three selected regions of Ghana and it discusses the extent implementation of IP management framework by these institutions. Participants relevant to the study were selected through purposive sampling approach. Qualitative research method was adopted and the data gathering technique was based on structured and semi structured interviews, administration of questionnaires, observation of available IP documents and files and experts' opinions. Through questionaires and face to face interviews, data was gathered on prevailing practices in the focus institutions. In the data analysis, an internal analysis approach was the basis of investigating the data in context within the sampled population. Narratives or conversations were analyzed. Within this context, visual materials or visual data were also applied. In the main analysis phase, confirmatory approach was adopted to enable a clear hypothesis about the data to be tested. The study revealed the status of implementation of a framework of IP management for protection and management of IP owned or generated by public research and academic institutions in Ghana. The study further established the extent of implementation of such a framework in the various institution. The findings indicate that in most of the institutions, even though there are some level of awareness of IP management strategies, there is lack of clear policies to administer the implementation and management of such strategies and this has given rise to inadequate staff knowledge on the instutions IP ownership, benefit sharing schemes and other institutional IP issues. This points out the need for the institutions to be very conversant with the national IP laws, IP Policies, strategies and regulations in Ghana, to effectively manage IP emanating from research conducted by their staff.

Key Words : Technology Transfer, IP Commercialization, IP Management Framework, Intellectual Property Right (IPR), Research and Development (R&D).

Declaration Page

I declare that this dissertation is my original work except where sources have been cited and acknowledged. The work has never been submitted, nor will it ever be submitted to another university for the award of a degree .



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(1 May 2021)

Copyright Page

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Dedication

I dedicate this project to God Almighty my creator, my strong pillar, my source of strength, inspiration, wisdom, knowledge and understanding. He has been the source of my strength throughout this masters program and on His wings only have I soared. I also dedicate this work to my friend and father and Formal HRM of the Ministry of Trade and Industry: Mr. Peter Owusu Sekyere who encouraged me all the way and whose encouragement has made sure that I gives it all it takes to finish that which I have started. To my sisters Mercy, Uenice, Afriyie, and Gyamfua and my brother Boat and Curson Dr. Harrison, Pastor Alex, Mr Sarfo, and Mr Cosmos who have been affected in every way possible by this quest. Thank you. My love for you all can never be quantified. God Bless you.

List of Acronyms and Abbreviation

IP	Intellectual Property
IPR	Intellectual Property Right
IT	Information Technology
R&D	Research and Development
TTO	Technology Transfer Office
TIC	Innovation and Technology Center
TTISC	Technology Transfer & Innovation Centers
IPMS	Intellectual Property Management system
PCT	Patent Cooperation Treaty
EPO	European Patent Office
USPTO	United States Patent and Trademark Office
KNUST	Kwame Nkrumah University of Science and Technology
CSIR	Council For Scientific and Industrial Research
TDTC	Technology Development and Transfer Center of Council for Scientific and Industrial Research.

Definition of Key Terms

Intellectual Property (IP): refers to any legal rights, resulting from intellect works in the area of industrial, scientific, literary and artistic (WIPO 2004). It also refers to creations of the mind, everything from works of art to inventions, computer programs to trademarks and other commercial signs (WIPO, 2020). There are two forms of Assets which can be owned by an industry, a company or an individual and these are classified as tangible and intangible assets. Intellectual property forms the intangible assets which relates to creations of the human mind.

Intellectual Property Right (IPR) are any legal rights, granted to creators of IP to give them protection or an exclusive right over their invention (i.e. intangible asset(s)).

Research and Development institutions (R&Ds): In this paper, R&D institutions are academic and research institutions whose activities are into research and development in the area of science and technology and other related engineering fields.

IP Commercialization: This involves the patenting and licensing of inventions for economic and moral remuneration/incentive. In some cases, it may also include Spin-Offs creation for some technology for sales. It serves as an important process by which research outcomes are applied in the industrial domain.

Technology Transfer Office (TTO): Technology Transfer Office provides an interface between industry and the institution, and is a unit or entity typically established by the institution to manage the IP management and technology transfer process on its behalf.

Intellectual Property Management System (IPMS): This system is involved in the administration of IP laws managing rights of IP owners and also administers research and development (R&D) output commercialization.

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CHAPTER 1 INTRODUCTION

1.1 Introduction

Ghana publicly financed research institutions comprise higher academic institutions (Universities and Polytechnics) and statutory science councils or research institutes (referred hereafter as institutions).These institutions undertake technological, engineering, scientific, medical and environmental research and development in Ghana. Some of these institutions are: The Council for Science and Industrial Research (CSIR), Kwame Nkrumah University of Science and Technology (KNUST), University of Ghana, Regional Technical Universities, Cape Coast University, Agriculture Research Institutes and Medical Research Institutes.

In recent years, the quest for development guiding principles for IP Rights (IPRs) protection and enforcement to safeguard and facilitate the management of works of skilled workers and researchers at the institutions has become popular and is on the rise in Ghana, Africa and many other developing countries. Ghana had now appreciated the impact of lacking a properly laid down enforcement mechanism for the enforcement of intellectual property rights and the impact it has had on the economy including the local industries and the creative/culture and artistic industries (Yawson, 2002).Developing countries due to inadequate knowledge of the concept and practices of IPRs protection fail to acknowledge the need for implementing an effective framework for managing IP creations, protection and other exploitations for economic gains. As researchers at these institutions innovate, invent, transfer or offer for sale (i.e. commercialization) of the outputs of their research in the industrial domain, they often express skepticism about the

relevance of IP management and protection for development, especially securing protection for the knowledge-based assets or the IP rights they develop for socio-economic development.

This study will explain the implementation and benefit of the introduction of an IP management framework that is specifically for the protection and commercialisation of intellectual property generated by publicly financed institutions in Ghana. The study will also investigate the existence of an effective IP management framework for guiding and regulating protection regimes in the works of these institutions in Ghana.

Even though utility models, registered designs, patents and copyright are typical IPRs generated in the selected institutions, the study is limited to the management or protection of research outcomes covered by patents and copyrights, and exclude other forms of IPRs.

1.2 Background of Study

It is believed that an efficient and equitable IP management framework can help all countries to realize IP's potential as a catalyst for innovation, economic development and social and cultural development and well-being. Like any other resources, IP needs to be properly managed in order to gain the value or benefits thereof. (Brant & Sibanda, 2019). African governments after emerging from post-colonialism still did not attach much priority to the need to protect IPRs. It is obvious that the trend in the globalization of business will accelerate international licensing and protection of IPRs. There is no doubt that Western countries' legal tradition of IPRs will be inflicted upon developing countries (Yawson

2002).Technological progress can take place through: scientific innovation and invention, the adoption and adaptation of pre-existing but new-to-the-market technologies, and the diffusion of technologies. Enormous gaps remain, especially in the case of the least developed countries. Technology development and transfer can be either accelerated or slowed depending on market conditions, fiscal and regulatory policies, availability of finance, access to information, the legal and institutional framework, human resource capacities, and the condition of infrastructure.

As global leaders are advocating and promoting an existence of a kind of smooth and a sustained linkage of interactions between owners and generators of IP/IPRs and players of the industrial domain. Governments across the globe have realized that R&D institution's activities contribute or play some roles to the success stories of most advanced nations. This has been fueled by the notion that successful and cordial relationships between the R&D institutions in the economy enhances the growth of the economy and the building of human capital through the exchange and transfer of knowledge, skills and innovations and innovative ideas. Therefore, the R&D institutions linkages with industry have become a major concern for government developmental policies across the globe. These institutions both privately and publicly financed have also attempted to formalize the ideas of establishing Technology Transfer Offices (TTOs) to respond to the quest of their governments.

Traditionally, some of these TTOs in certain countries, especially in universities have facilitated technology commercialization through the implementation of IP management framework for IPR protection and the commercialisation of IPR's

resulting from their research outputs to industry (i.e. licensing or outright sale of copyrights, patent, trademark, and etc.) However, creation of a TTOs within these institutions with emphasis on that of universities is often viewed as instrumental to secure a sufficient level of autonomy for developing relations with industry.

To ensure the protection of rights to ownership, licensing, transfer, offer for sale or commercialization and other exploitation of the IP in relations with industry, an institutional IP management framework must be put in place. Generally, traditional IP management framework usually has the following key areas of responsibilities: monitoring of IP generation, disclosure of generated IP, protection of IP developed or acquired, IP portfolio management, IP valuation, assist in competitive assessment and strategic decision-making.Research outputs of most institutions include; patents, copyright, utility model, designs, trademarks, technology know how, confidential information, generation of new knowledge and ideas, new processes/products etc.

Commercialization of research outputs often involves licensing of the outcome of innovation; thus, it is an important process by which a research output is applied in the industry. It is a way of rewarding research investments that can accrue to the economy and society at large. The IP commercialization process depends to a large extent on the availability of enabling legislative and policy frameworks that support the effective identification, protection, and management of any IP that are associated with the research results.With patent and copyright, authors, creators and artists have both moral and economic rights to their works or inventions. With economic rights; authors, creators and artists or inventors in general have the right to benefit from their work financially through the selling of work or license. With

moral rights, authors, creators and artists or inventors have the right to be acknowledged as true owners of the work and as such have the authority to claim ownership and oppose any actions that could harm his or her reputation. However, to ensure certainty in respect of ownership of works and inventions, a system or framework of protection of IPRs is cited as the best measure to curtail that within the concerned institutions and organizations and therefore justifying the need to implement an institutional IP management framework.

The TTOs' activities within academic institutions has been identified as very significant to the influx of new ideals, technologies, processes and skills sets in the global world's economies. Therefore, there must be a protection and rewarding system to ensure the interest and benefit of the institutions, individuals and groups involved in the inventions are met. This is the reason why this study is very important. It is to investigate the existence of such a protection system in the institutions in Ghana as they create and invent to generate IPRs. The study also seeks to investigate ways to enhance implementation and sustenance where there is no such a system. This would serve as a way of promoting and ensuring originality in the new creations' inventions, new skills developed and also to create incentives for the owners and those involved in creation of the new invention.

1.3 Statement of the Problem

There are several institutions in Ghana. However, there is no common understanding on the extent to which these institutions are aware of IP management, protection and commercialization of research output. Even though some of these institutions are aware of IP existence in their works, there is still a

gap in their knowledge of how IP should be managed for public benefits and economic gains. The IP management framework is to serve as a guiding principle or policies to developing IP, identifying IP, protecting IPRs, and leveraging the same into the market and thereby increasing revenues, generating economic and moral incentives and other economic gains. It is also to assist organizations to evaluate their IP portfolio.

The challenges faced by the institutions in their efforts in the area of IP management is centered on developing indigenous capacity to generate, identify, protect and adapt IP as well as technologies to the local conditions. In the same vein, there are several facets of barriers that are hindrance to commercialization and transferring of the technologies & skills or R&Ds outputs developed by the institutions. These hindrances could arise at various stages of the transferring or marketing process. Some of these hindrances are; tensions that exist between the inventing institutions and commercial demands, unethical public exploitation and application of free access to the right involved in the public inventions. All this can affect the researchers who produce and transfer these research technologies and skills and academic outcomes. These tensions are attributed to the difficulties and challenges in transferring or commercializing research outcomes. The other hindrances can be funding, skills requirements, university and industry collaboration, the research institution and public users' collaboration etc.

In publicly financed research institutions, research outcomes are to be transferred to the users of such technologies or the general public for effective implementation and further research. Moreover, security to the transfer and further exploitation of the IP in those creations are difficult to maintain since they

are publicly owned and immediately disbursed for public use or left in public domain for further exploitations. The research is to address this gap by investigating the extent of institutional arrangements for the implementation of IP management framework for IP generation, protection from unauthorized exploitation like copying, stealing, non-ethical use and other wrongful exploitation.

As patent and copyright are very important and predominant IP generated by selected public R&D institutions. The study will be limited to only these IPs, and excludes the others due to time constraints, study scope and also due to the fact that these two IPs are predominant in the IP developed by these two category institutions.

1.4 Research Objectives

The main objective of this study is to identify and analyze the extent of institutional arrangements for implementation of IP management framework for management and protection of IP generated, acquired or owned by the focus institutions of the study (i.e. publicly financed research and academic institutions) in Ghana.

The specific objectives of the study are given below:

1) To identify the IP owned by the institutions (i.e. generated, or acquired IPs).

2) To identify existence of any IP management framework including the availability of policies, institutional arrangements, or processes that the

institutions have put in place to guide and support IP protection, management, and technology transfer to industry, focusing on copyright and patents.

3) To suggest a strategy for a successful implementation of a proper and effective framework for protection, management and technology transfer of IP at the institutions.

1.5 Research Questions

The research questions addresses “gaps in knowledge” of IP asset management by examining the implementation of an effective IP management framework by the focus institutions of study with emphasis on those in regional capitals cities of three major regions (Greater Accra, Ashanti Region and Eastern Region) of Ghana.

The objectives of the study forms the research questions or the interview questions for the data collections. The interview questions are structured according to both open-ended and closed-ended structured questions mode, while research observations are structured on a closed-ended base.

The questions were administered through one-on-one participatory interviews. Each question is supposed to contribute to testing of one or more assumption questions established in the research design.

The main approach for reaching respondents with the questions was through personal contact, and focus group interviews.

1.6 Assumptions

The Assumption of this study is identified as a directional assumption; it stipulates the direction of the expected differences or relationships. The assumption of this study is based on an observation (i.e. simple inductive assumptiom). It states the expectations concerning the relationship between the variables in the research problems. It states clearly the expected relationship between the variables of this survey and defines those variables in operational, measurable terms.

In this study the assumption states that, If the institutions of study want to benefit economically and morally from their IPs developed (patent and copyright), then it is imperative that they understand the need for, and implement an effective framework for the protection, management and commercialisation of IP for public benefit and economic gains. Moreover, if the institution does not have or implement any form of framework for the protection, management, and commercialisation of IP, then it is expected that it will not effectively manage its IP and as such will not secure protection for the IPRs involved and also may not be able to prevent unauthorized exploitation and unethical application or exploitation by third parties, and this forfeit commercial benefits from the outputs of research undertaken at the institution.

This research study achieves proof with available data obtained through the institutional investigations conducted during the assessment and then tried to suggest ways of improving on them or filling any knowledge gap that needs to be filled for implementation of such a management framework.

1.7 Significance of the Study

The significance of this study is to analyze the extent of institutional arrangements for the implementation of IP management framework within publicly-financed research and academic institutions in Ghana, for IP generation, protection and transfer into the industrial domain.

The management of IP serves a purpose of IPRs generation, protection and transfer to industry to generate revenue or incentives to the right owners or innovators through the license acquisition, and other exploitation. Furthermore, the study is also to enhance the formulation of a good IP management practice within the institutions of the study and then suggest a strategy for a successful implementation of such a framework.

The knowledge produced would be applicable outside of this research setting with implications going beyond the group of institutions that have participated in this research. It is expected that the IP management framework will be used for IP identification, protection, and commercialisation, including licensing and technology transfer within and outside the institutions.

1.8 Delimitations of the Study

One possible delimitation of this study is the geographical location, which encompasses only three major capital cities of three regions of Ghana.

Second delimitation is that due to COVID 19 pandemic, the study is limited to only three major regions out of the sixteen regions in Ghana.

Qualitative research, as this research study is, has some important limitations; The very openness, flexibility and richness of qualitative research may make it difficult to make comparisons between data or to see the big picture. (Flick 2015, p. 213). The questionnaires for the survey was administered within three weeks and the rest of the stipulated time for study was for documentations (results drafting, correction, and reporting).

1.9 Limitations of the Study

This study focuses on investigating the existing, and status of implementation of a framework of IP management for protection and management of IP owned or generated by public research and academic institutions in Ghana. Constraints and restrictions by Governments rules and regulation to curtail the outbreak of the COVID 19 pandemic also impacted on the study. Accordingly, two public institutions (research institution, and academic institution) were selected in each of the three (3) major Regions in Ghana. Also, as patents and copyright are common IP generated and expectedly to be secured within the context of the institutions involved in this study, the study is limited to the management or protection of these IP only (patent and copyright), and excluded the other IPRs.

Though this research approach can be applied to other institutions and regions in Ghana, the findings of the research is associated and applied to only the institutions and regions observed or investigated in this study.

Since a qualitative research approach is more appropriate for small samples, it is risky for the research results of qualitative research to be perceived as a true

reflection of the opinions of a wider population (Bell, 2005) as cited in (Langko, 2014).

Open questions questionnaires due to their nature in a way may produce unexpected results, which can make the research more original and valuable. However, it is difficult to analyze the results of the findings when the data is obtained through the questionnaire with open questions.

The dissertation exhibit the following limitations:

Some of the respondents refused to tell or share stories that seems to be against their organization.

Because of the usage of already prepared questions as the core of the interview, there were some instances that respondent omitted some points that were in fact essential for the interviewee.

Due to the COVID 19 Pandemic restrictions, some participating institutions were not willing to produce enough records, notes, statements and other documents that were needed for the research to ensure a record of a closely/true picture of the situation.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

The chapter provides a systematic literature review of the intersection between intellectual property management and the extent of institutional arrangements for its implementation as a management framework within publicly financed research and academic institutions as they generate or acquire IPs/IPRs. This is a review of related studies in the context of the research/study area. The purpose of literature review is to investigate the problem in depth, likely overlooked issues, seek methodological insights, anchor the study on theory and recommend further research (Gall, Gall, & Borg, 2007).

IP registration helps institutions to audit its skills, resources and innovations with a focus on appropriate leveraging of the same. It also assists in claim validity, infringement and defense and provides a quantitative indicator for the output generated by the institution (Jain, Raghavan and Jha; 2009). The mere acquisition or accumulation of IP assets or IP rights does not grant any value appropriation from the innovation or any return on investments (ROI). To this purpose, institutional arrangement for the implementation of IP management framework not only becomes a critical challenge for institutions, but also a practice they cannot do away with in case they want to reap the benefits of their IP (Bader et al., 2012). However, any technological development has intellectual property created in it; hence, it is pertinent for an institution to have an integrated IP management outlook (Jain, Raghavan and Jha; 2009). Accordingly, IP management involves all activities from defining and executing the IP strategy, generating and commercializing or recouping of new IP values, licensing, buying

and selling IP, as well as monitoring third parties' IP as part of business intelligence (Gassmann & Bader, 2007).

IP management is an important task, as it both enables and restricts the utilization of research results and impacts the competitiveness of technology-based business. It is an important tool to leverage innovation and secure sustainable competitive position (Davis and Harrison, 2001). Even though publicly financed academic and research institutions dedicate a lot of energy and resources in generating IP and protecting it for commercial and economic gains, most are not capable of capitalizing on and extracting value from the IP due to lack of relevant institutional arrangements for managing the exploitations of the IP. To that end, research on IP in the last few years has departed from the traditional economic and legal perspective to a more strategic and managerial approach, based on the indication that IP decisions often have serious consequences for an institution's business, that reach far beyond the legal aspect of typical IP-related disputes (Di Minin and Faems, 2013).

This study contributes to the need for effective institutional arrangements for the implementation of IP management framework. Literature in this Chapter shows that previous studies of IP management in publicly financed institutions in general tend to adopt a simplistic view of IP management, which advocates an approach that IP generated or acquired should be protected through patents only when intended for licensing to third parties (Barnard and Bromfield, 2009). Moreover, academic research into actual practices at technology transfer offices of some institutions appears to focus on improving efficiency and outputs measurements in terms of numbers of IPRs (patents, copyrights), licenses and spin-offs. (Jain, &

Sharma, 2006; Sibanda, 2009; Krishna & Chandra, 2011; Holgersson, & Aaboen, 2019). Research also suggests that governments should put in place enabling legislation and policies to encourage stronger IPR protection amongst both public and private institutions" (IPR Framework 2006), as cited in (Brant & Sibanda, 2019).

2.2. IP Management Practices in some Countries across the World.

2.2.1. South Africa: The Intellectual Property Rights from Publicly Financed Research and Development Act (IPR Act)

In 2008, South Africa promulgated the Intellectual Property Rights from Publicly Financed Research and Development Act (IPR Act) which came into effect in 2010. Under the IPR Act, "intellectual property" comprises any creation of the mind that is capable of protection by any law and includes rights to an invention or Patent, and copyrights (Brant & Sibanda ,2019). The IPR Act applies to all recipients of public funds from any government institution – whether at the national, provincial or local level – that uses these for R&D activities (Brant & Sibanda, 2019).

The IPR Act provides for the mandatory IP management of publicly funded research outputs, and requires special benefit-sharing arrangements for IP creators at publicly-funded research institutions. It further establishes the National Intellectual Property Management Office (NIPMO) and the associated IP Fund to cover the cost of securing and maintaining IP protection for public research outputs. In addition, the legislation requires the establishment of TTOs to ensure the IP management and technology transfer needs of all institutions in South Africa are addressed. The regulations for the IPR Act was accompanied by implementation plan for guidance as to timeframes for actions, decision-making regarding licensing, and dispute settlement. According to the legislation,

NIPMO's main role is to oversee the implementation of the IPR Act and, in particular, the activities of TTOs at individual publicly-financed research and academic institutions, to support IP management and commercialization decision making regarding publicly funded research outcomes, to provide IP transactions guidelines for local versus foreign entities, to monitor and review execution of the IPR Act, and to manage all relevant information. NIPMO is also empowered to take ownership of IP derived from publicly funded research on behalf of the government in order to advance its commercialization under specific circumstances, and it has certain access rights (Brant & Sibanda ,2019).

According to Bansi & Reddy (2015), the Act seek to address the situation where IP developed by researchers, lies idle at universities or is sold off to private companies, often overseas, with no benefit accruing to the universities, the government or south African people. After the passing of the Act, the management of IP at universities in South Africa, had new dimensions which is in granting universities the right to register IP from publicly funded research. There was the expectation that the development and commercialization of technology within South Africa will benefit the country and its citizens. However, not all stakeholders saw the provisions of the Act as favorable (Bansi & Reddy, 2015).

According to Moore's (2009) study revelation, as cited by Bansi and Reddy (2015); it maintains that the key principle at play is that, where State funds have been used to generate IP, the State and the South African public should receive some benefit from that IP. The IP Act therefore heralds a dramatic shift in ownership of IP rights from publicly funded research, which includes research undertaken at a university. At the time, there was little data as to how South African innovators, whether public or private, were using patents as tools to

commercialize their ideas and scientific discoveries (Sibanda, 2007) as cited in (Brant & Sibanda, 2019).

According to Bansi and Reddy (2015), The failure of government to benefit from the commercial exploitation of inventions emanating from government-funded research has been attributed to a lack of motivation by universities to turn their research findings into marketable products. According to Dickinson's (2007) studies, as cited by Bansi and Reddy (2015), In the US, this was remedied through the passing of the Bayh-Dole Act which resulted in giving control to universities over their inventions, increase in university patent, increase in economic activity, jobs and new companies due to the commercialization of new technologies emanating from academic institutions.

The universities in South Africa were found to have relatively low levels of filings, and patenting activities were concentrated among just a few universities due to the lack of market for their inventions (IPR Framework 2006) as cited by Brant & Sibanda (2019), and an absence of IP management culture, incentive structures and preference for publications over patenting. According to Brant & Sibanda (2019), the generally low rates of patenting by South Africans had been stagnant since 1998 and there was a very low contribution by other research institutions apart from universities to patenting activity at the South African Patent Office. Only institutions with institutional IP policies that governing research undertaken at the institutions were those with a relatively active filing strategy in the period after the promulgation of the IPR Act. To a large extent, the IPR Act has introduced a number of important changes in how publicly funded research outcomes are managed and commercialized in South Africa.

2.2.2. IP Management Practices in Indonesian Publicly Financed Institutions

The researcher has reviewed IP management practices at a publicly funded university in Indonesia, Bogor Agricultural University (Institute Pertanian Bogor, IPB), which has been focused on becoming an entrepreneurial, research-based university to contribute to the country's goal of promoting innovation and global competitiveness. IPB is the largest agricultural university and an important player in Indonesia's innovation systems for agriculture; and is representative of how Indonesia's academic institutions are responding to regional and global challenges and opportunities, given Indonesia's current status as an emerging and booming economy, and a net importer of IP-intensive goods. IPB has sought to strengthen protection of IPR, a relatively new concept in the country (Payumo JG et al., 2014). IPB established the Office for IPR and Publications (OIP) that manages technologies and innovations coming out of university research as done at its peer Indonesian institutions such as the University of Indonesia, Bandung Institute of Technology, and Gadjah Mada University (Payumo JG et al., 2014). OIP is located under the Directorate of Research and Strategic Issue Studies (DRSIS) which is responsible for formulating IPB's research agenda. The key functions of OIP is to coordinate the management of university technologies for deployment in the public domain, including their protection; dissemination to the scientific community via non-commercial mechanisms including teaching, seminars, trainings, publications, and community engagement.

Whereas in the early years of OIP it did not have the legal mandate to manage the monetary benefits resulting from technology transfer activities, and was just involved with IPR protection in particular patents, and signing of licensing agreements, this could not be sustained as the focus was not on ensuring monetary

benefits to IPB. OIP faced challenges which included: (1) limited number of IP management staff with requisite technology transfer and marketing skills and professional knowledge, which resulted in delayed responses and coordination with internal units (research centers, business units, and administration) and external partners. In addition, there was limited competency and knowledge among researchers on the importance of protecting and commercializing research results. The lack of institutional policy on IP ownership and benefit-sharing made faculty and staff less engaged on the technology transfer process. With the designation of autonomy status and the enactment of national laws related to IP and technology transfer for HEIs, IPB has implemented many changes and policies to help address these challenges and improve the university's performance in managing university IP and innovation (Payumo JG et al., 2014). Some of these laws and policies include (Rector Decree 136/K.13/PG/2004 and 209/K.13/PG/2004) which represent Intellectual Property Rights Guideline on how to regulate intellectual property rights of collaborative undertakings by IPB and other institutions (public or private, local and abroad). These guidelines provide better clarity on university ownership of IP, commercialization and benefit sharing of monetary returns between IPB and researchers (Payumo JG et al., 2014). These guidelines have resulted in IPB's faculty members and researchers receiving the extraordinary intellectual property award for technology from the Government of Indonesia; as well as increased patent and trademark applications, which have been licensed to several private companies or are being commercialized by university spin-off companies. IPB also received a recognition award from the Vice President of the Republic of Indonesia commending IPB as the university with the most patent applications and granted patents in Indonesia

for five consecutive years. These numbers contributed significantly to the increase of Indonesia's own citizens applying for patents locally, which in 2012 almost equaled foreign applications. In 2012, IPB's licensing and commercialization projects exceeded 179, rep-resenting a five-fold increase since 2008 (Payumo JG et al., 2014).

2.2.3. Impact of the Bayh-Dole Act as a legislative instrument for IP management in USA

The Bayh-Dole Act (BDA) was enacted in the USA in 1980 to promote utilization of inventions that arise from federally funded research and development. The BDA has had profound impact on technology transfer specifically with respect to universities in the USA and has also influenced similar legislations in other countries, such as South Africa's IPR Act discussed above.Prior to the BDA, universities and research institutions were often unable to take ownership of inventions made with federal funding, much less grant exclusive licenses to promote practical application. Institutions that maintained title over inventions often were unable to fully commercialized the inventions, which led to underutilized patents and suboptimal public benefit. There were no real incentives to patent inventions arising from federally funded research for technology-based innovation. There was very little drive for public-private partnerships or for entrepreneurship. Furthermore, the government often made it difficult for companies to gain an exclusive license to the inventions, which hampered the ability to fully explore and market the ideas (Gotkin,2012; Copan, 2020).

Congress and President Jimmy Carter advocated a change to ensure that those receiving federal funds had a greater ability to commercialized inventions and

contribute more to society. The BDA was a compromise of sorts a shift of ownership title away from the government and transfer that to universities and small businesses, that were funded by federal funds. Without intellectual property protections or exclusivity, companies and investors were not making the major additional investments so often needed to move technologies arising from federally funded research into production, into the market and to benefit the people (Copan, 2020). Shortly prior to the passing of the BDA, Congress noted that "many new discoveries and advances in science occur in universities and federal laboratories, while the application of this new knowledge to commercial and useful public purpose depends largely upon actions by business and labor (Gotkin, 2012). Congress further stated that cooperation among academia, industry, and the government is vital and should be expanded and strengthened.

The impact of the BDA has been to promote job creation, economic growth, sustainable development and improved living standards for all Americans. The BDA has led to other countries across the world, enacting similar legislation across the world.

2.2.4. Institutional IP: A tool for economic growth

There is a general consensus among policy makers that universities and research institutions are tools for economic growth, specifically through the commercialization of the research results, and innovation (Kamaruddin & Samsuddin, 2013). To compliment this, it is better that these institutions develop clear institutional policies which includes benefit-sharing arrangements for inventors and also develop policies that are consistent with national or any institutional legislation that provides guidelines on the development of such institutional policies and requirements for IP management and commercialization

(Jain & Sharma, 2006; Sibanda, 2009). The institutional IP generated generally needs to be managed though not only for the purpose of commercialization or providing incentives but also for moral right protection thus, protection from miss utilization or unethical exploitation and also for a better innovation governance for guiding the innovation process. According to Adam Mossoff (2012), the initial labour theory claims that the laborer would deserve "moral property rights in the product in virtue of his labor" (Mossoff, 2012).

Patents and trade secrets could be used for monopoly purposes instead of incentive purposes, as intended (Du Bois,2018). This therefore demands an institutional attempt to implement a management concept of a sort to see to the exploitations, protection and accessibility of the IPRs involves in the work. For these reasons the incentive theory may not justify the institution of intellectual property (as is) as well as it may seem.

There is no one best way to manage IP, many managers overestimate the attractiveness of using IP to exert market power. Rather, the value of the various means to protect and benefit from IP depends on the institution's strategy, the competitive landscape, and the rapidly changing contours of intellectual property law (Fisher and Oberholzer 2013). Therefore, institutions are expected to promote their patent portfolio of products, process and application patents to build reputation as innovation companies in order to attract new and retain existing customers, employees and investors (PriceWaterhouseCoopers, 2007). In addition, the focus appears to be on the technology transfer aspects of IP Management with much emphasis on commercialization of R&D results by technology transfer offices with industry.

Even though most of the studies in the subject area focus on developed and developing countries in general, there is a visible gap in reviewed litereature of studies conducted on the topic with respect to Ghana, in particular, available literature reviews do not entirely address or scrutinized the situation of Ghana on how the country's publicly funded research and academic institutions capitalized on IP management framework for protecting or managing the IPRs generated. This study, therefore, seeks to unravel the reality on the ground by filling the study gap with respect to the subject matter in the context of Ghana.

2.2.5. IP management in Ghana universities - what does the literature say?

Most global universities have benefited from ground-breaking solutions with the commercialization of outcomes/results of research activities (Bansi, 2012 ; Mowery et al , 1999). Developed and developing countries are also seeking to increase the contribution that university research and development makes to national economic growth and to acomplishing this has led governments to restructure the institutional environment, usually through establishing clear intellectual property ownership policy in favour of universities, and by providing support programmes for the commercialization of technology (Bansi, 2012). As was the case of South African universities, relevant institutional arrangement for the implementation of IP management was identified by the universities as a crucial element for advancing the commercialization of South African public research outcomes, as well as for the monetization of traditional knowledge and genetic resources, in order to create wealth and benefit South African citizens (Brant and Sibanda, 2019). The Kwame Nkrumah University of Science and Technology (KNUST) through relevant research, has also sought to make significant contributions to finding lasting solutions to Ghana's technological,

economic and social challenges. However, the university realized that there is no existing policy or document to protect the rights of researchers in putting research findings on both the local and international markets. Most of these research outcomes and other information related to IP have remained on the shelves and for decades of KNUST's existence, the institution has missed out on great economic rewards. However, in order for KNUST to contribute within the regional and global context, all of its stakeholders are to be made aware of the issues relating to intellectual property to avoid misunderstandings on ownership rights (Kwame Nkrumah University of Science and Technology, 2015).

As part of the strategic planning mandate of the Quality Assurance and Planning Unit (QAPU), of the Kwame Nkrumah University of Science and Technology (KNUST) of Ghana. The university initiated an IP policy and proposed for approval by the Academic Board which was approved by the 346th Regular meeting of the Academic Board held on 23rd October 2015 (Kwame Nkrumah University of Science and Technology, 2015).

The policy seeks to provide guidance in relation to matters of ownership, distribution, commercialization in context of technology transfer, development of technology and innovations developed by KNUST staff, students and others conducting research in the University. Also, in order to prevent delays beyond the minimal period, the dissemination of information must also be defined so as to protect the rights of all parties. Frequently, inventions, discoveries, and creative works that are developed by individuals at the University will have commercial as well as scientific and scholarly value. The intent of this policy is to provide for incentives that foster creative activity and to help assure everyone that any intellectual property produced will be exploited for the benefit of the creators, the

university research enterprise, and the public. To help meet these policy objectives, the University is to make available technical and legal assistance in procedures necessary to protect ownership of intellectual property and to aid in its commercial development (Kwame Nkrumah University of Science and Technology, 2015).

2.3 Theoretical Framework

Approaches to intellectual property are anchored on ethical, moral and economic issues and various theories, such as: the theory of natural law, moral desert theory, personality theory, utilitarian theory, reward theory, economic theory and social-planning theory (Omillo & Okubo, 2018).

The theory of natural law is derived from the principle that one owns that which one creates by one's own (intellectual) effort and labour (Du Bois, 2018). A first step towards recognizing intellectual property on natural-law principles is evident in the rules of *pictures,* where the painter, and not the owner of a tablet upon which a painting of the picture has been made, becomes the owner of the finished work (Du Bois, 2018).

According to the reward theory of intellectual property, society rewards inventors and writers in the form of a legal right to exclude other persons from certain forms of use of the work for making the works publicly available. Where intellectual property encourages disclosure of works that would otherwise remain secret, intellectual property rights (particularly patents, works of copyright and registered designs) enhance free flow of information (Du Bois, 2018).

One version of the economic theory states that since intellectual property is made scarce through artificial constraints imposed by a legal framework and restricts public access to the intellectual work, a justification for intellectual property rights should be founded on the creation and protection of investors value (Van der Walt & Du Bois, 2013). Other argument of the economic theory also point out that, without specific property protection, suppliers would not produce and supply to the market even with the potential for high profits. This argument draws from the free rider principle: opportunists should not be allowed to reap where they have not sown, otherwise there would not be incentive to invest skill and resources to create (Du Bois, 2018. p 27).To build the interest of the society in intellectual property, according to the incentive theory, legal protection for intellectual works serves as an incentive for the production of more intellectual works that will ultimately benefit society (Du Bois, 2018). This incentive promotes the further creation of valuable intellectual works by granting property rights in such works (Du Bois, 2018).

According to utilitarian theory, copyright law provides the incentive of exclusive rights for a limited duration to authors to motivate them to create culturally valuable works. Without this incentive, authors might not invest the time, energy, and money necessary to create these works because they might be copied cheaply and easily by free riders, eliminating authors' ability to profit from their works (Fromer, 2012).If application of an intellectual property theory can decrease access to products more than it increases production of new products, like the theory of the creation of monopoly, then the need to implement an IP management framework is justified.

2.4 Theoretical Frameworks Relevance to the Study

The theoretical framework demonstrates an understanding and concepts that are relevant to the implementation of IP management framework for the protection and management of IPR generated by the public research and academic institutions to influences the public or the national economic outlook in the area of IP generated as national intangible asset to be made available for national use instead of commercialization for private or individual gains. Studies on the subject matter have shown that research on IP managements in publicly-financed institutions is limited and simplistic due to the transaction-oriented nature of recent TTOs operating within the institutions. The TTOs primary focus has being on increasing the patent output instead of looking for efficient and effective governance structure. This study will contribute to academic literature as well as complimenting policy debates on the subject area by uncovering the "grey area" between publicly-financed R&D institutions and Industry.

2.5 Chapter Summary

IP management includes all the activities from defining and executing the IP strategy, generating, protecting and commercializing newly developed IP, licensing, buying and selling IP, as well as monitoring and exploiting third parties' IP as part of business intelligence. However, the concentration of this study is specifically on patent and copyright.

The major concern in institutions of today in Ghana, especially publicly-funded research and academic institutions, is that there is a huge gap in intellectual property generation versus its commercialization. They key issues is how this gap between IP generation and its commercialization can be reduced. Hence, the need

for IPM framework, to assist technology transfer offices, and IP managers to effectively manage or protect their institutional IPRs.In previous research studies on the subject matter, a major limitation identified are the need to practice institutional IPR management to control or manage IP applications and right protection by the TTOs and IP managers.

Like other developing countries, one of the main problems Ghana faces is lack or limited institutional capacity to implement the existing laws on intellectual property. Most of the general public still have limited understanding of IPRs, its management practices and the implications/impact of instituting effective IP protection systems, policies and other strategic IP developmental activities. There are very few people and institutions on the African continent as whole with experience and capacity to handle IPRs, especially with regards to research results/ outputs of public funded institutions involving trade and industrial sector and other worldwide economic imperatives. There is lack of expertise and limited knowledge on the state of research and policy analysis in IPRs relating to research results and other university inventions, existing capacities and limited institutional capacities and also there is a big institutional challenge to communicate research findings to relevant experts and institutions for proper arrangement for an incentive or reward system to be rolled up.

The study recommended that policy interventions would be required to, among others, generate IP/IPRs awareness among the general population with special focus on research and academic institutions, review the existing IP legislations to correspond to modern trends and strengthen institutional and human capacities to absorb technological knowledge in order to be able to create to enhance the

country’s creativity and innovation.There is lack of clear policies within the publicly funded research and academic institutions in the area of IP administration and management and this has given rise to the problem of lack of autonomy especially for the public research institutions.

Most public research and academic institutions rely on the central government for the funding of their research budgets. This is known to affects the ability of the institution to adopt the best administrative practice and management framework for managing the IPRs generated including the use of IP related technologies.

CHAPTER 3 RESEARCH METHODOLOGY

3.1 Introduction

This chapter deals withthe research methodology of the dissertation.It addresses the fundamental design components of the entire research activities, and in particular, outlines the reserch background, research approach and design, data analysis and procedure, and some identified biases. More particularly, the chapter discuses highlights and discuses data collection methods, selection of samples, research instruments and also describes the population and participants selection and recruitment. Data processing and analysis strategy as well as ethical considerations and research limitations are dealt with. Data sampling and sampling techniques are identified and utilized for the sample identification and selection. The selected/sampled data are then collected and analyzed.

The research will be conducted on publicly-financed research and academic institutions located in three regional capital cities in three selected regions of Ghana. The data gathering technique would be based on structured and semi structured interviews, administration of questionnaires, observation of available IP documents and files and may also consider experts' opinions if found necesary.

3.2 The Research Design

To achieve the research objectives, and to gather in-depth insights into the problem that is, to understand IP management concepts, opinions, or experiences of the focus institutions of the study, qualitative research method was adopted.

Based on the gaps in current reviewed literature regarding the institutional arrangements for the implementation of Intellectual Property Management framework for managing IP/IPRs in Ghana institutions, further research need to be conducted in an exploratory manner guided by the gaps in the reviewed literatures on the subject matter.

Generally, research can be categorized by purpose or by methods and the design can be categorized as either descriptive or causal. Descriptive studies are meant to answer questions like who, what, where, when and how. Causal studies are undertaken to determine how one variable affects another (Kothari, 2016). If a research is categorized by purpose, it would fall into two major categories: basic research and applied research (Kothari, 2016).This study research is based on pure and applied research methodology and is classified by purpose, which means a classification of research to deals with practical problems that use basic research or past theories, knowledge and methods for solving an existing problem (Kothari, 2016, p. 53).

The research approach is not a deductive research but rather, it is an inductive research approach which is embodied as a pure or fundamental research undertaken for an increase in knowledge. Even though applied research is opposed to pure research because pure research is not problem-oriented but for the increase in knowledge which may or may not be used in future (Kothari, 2016),

the study implements the two concepts as the research methodology. Much emphasis will be placed on the implementation of the applied research approach since it focuses on uncovering what needs are not being met and use that information in designing a framework for IP management practices that will lead to an effective output commercialization. Notwithstanding the existence of related research studies in the subject area across the world, this proposed research took a dimension that is specific to Ghana's publicly-financed research and academic institutions for such similar applications and so making this research study essential in the context of Ghana publicly-funded research and academic institutions implementing IPM practices.

3.3 Population and Sampling

The sampling procedure applied in this qualitative research is a purposive procedure (of experts, for example) or theoretical sampling. That is, participants relevant to the study were selected through purposive sampling approach. According to Cresswell et al (2007), purposive sampling, also called judgment sampling, is one of the several sampling approaches used in qualitative research for the identification and selection of individuals that are knowledgeable about a phenomenon of interest. The rationale for using purposive sampling technique is based on respondents' particular knowledge of, and/ or experience with the focus of the empirical inquiry or the field of study. However, the major problem with purposive sampling is that the type of people who are available for the study may be different from those in the population who can't be located and this might introduce a source of bias (Creswell & Poth, 2016).

Participants in this study are involved in the study as either groups of publicly-financed institutions or individuals, who are expected to contribute their experiences and views from their perspective as they are associated with the matter or subject of study. Participants selection would begin with the identification of the population of interest which in this study is the population of publicly-financed research and academic institutions from three regional capitals of three major regions of Ghana (Greater Accra, Greater Ashanti and Eastern region). The three regions form a larger population and the subset in which a population sample of three regional capitals are selected. Within these three regional capital cities is where the institutions of the study are typically or predominantly located including a benchmark or an expert institution. Among these institutions, a sample is selected, that is, one respondent is selected to represent each institution for the survey.

In the context of this study, the selected regions and their capitals cities are Greater Accra—for Greater Accra region, Greater Kumasi—for Ashanti region and Koforidua—for the Eastern region. The reason for the selection of the three regions and their regional capitals instead of the sixteen (16) regions of Ghana as given already is that the focus institutions for the study are predominantly located in these three (3) selected regions.

Categorically, individual or group participants for the study would be one (1) member from each category of the population sample (publicly-financed research and academic institutions in each region) to which the total number of respondent for the two category institutions would be six (6). So the samples will be divided into publicly-financed research institutions members and academic institutions

members and randomly select equal numbers within each subgroup (or “stratum”) To this connection, three (3) respondents each would be selected from publicly financed research and academic institution with both, having a respondent for each region, drawn from one publicly financed university, and a public research institution from each of the three capital cities of the three selected regions. Additionally, one (1) respondent would be selected from a benchmark/expert institution to serve as a benchmark response or expert view for the survey making the overall total respondents for the survey to be seven (7). With this technique, there would be the quarantee to have enough of each subgroup for a meaningful analysis.

The study will utilize a mixture of sampling methods and techniques (such as standardization and stratification techniques) and stratified sampling method for gathering and treating the subjects for the studies. This is to ensure that each category of subjects receives the same questions in the same order. This is to ensure uniformity in the testing and also assures that no subject bias occurs.

Stratified sampling technique would be used to break down the population into specific subsets or separate “strata” before a sample is selected for the survey from each stratum to produce a stratified sample. A stratified sample allows the choice of the subject pool randomly from a predetermined set of subsets (Kothari, 2004, pp.76-80). Because of the existence of subgroups in the population, stratified random sampling will be utilized (Creswell & Poth, 2016).

Stratified random sampling is used when there are subgroups in the population that are likely to differ substantially in their responses or behaviour. This sampling technique treats the population as though it were two or more separate populations

and then randomly samples within each (Creswell & Poth, 2016).Non-probability samples will also be part of the sampling technique because of the fact that groups of subjects would be chosen based on their availability rather than their degree of representativeness of the population. Within this method, those who respond to the questions do not necessarily represent the population at large. Instead, they represent that population who were available at the time of the survey and were willing to respond to the questions or those who took their time to complete and return the survey. This method is not considered standardized but it allows for gathering large amounts of information in a relatively short amount of time.

3.4 Data Collection Instruments

Data collection is about planning for and obtaining useful information on key quality characteristics produced by the research process. The key issue in data collection is not "how do we collect data" but rather, "how do we obtain useful data (Kothari, 2004, p.65). The decisions about choosing and putting together empirical material (cases, groups, institutions, etc.) would be made in the process of collecting and interpreting data (Flick, 2015).

The technique or tools for gathering research data includes the qualitative and the quantitative technique or tools. Qualitative research method is a kind of research that provides a detailed description of a research topic rather than generating statistical findings.

This study adopted a qualitative research method, which is primarily exploratory in nature. Due to this, the selected technique, instruments or tools for gathering data for this research is the qualitative technique. This research method uses techniques, such as focus groups, interviews, observation and case studies to

uncover trends in thought and opinions, and dive deeper into a research problem. It was considered the most appropriate research method for the study because little is known about this subject area in Ghana, and as a result, it allowed for detailed insights into the research topic.The researcher served as the primary instrument for the investigation or data collection to ensure accuracy of the data. Primary data (immediate data) would be collected as the main data for the study but would also be augmented or supported by some available Secondary (internal and external) data that may be found to be important for the study analysis. Secondary data whether internal or external, is data that has already been collected by others, for purposes other than the solution of the problem on hand (Kothari, 2016, p.116).

The most popular way to collect primary data consists of surveys, interviews and focus groups (Kothari, 2016, p.114). nevertheless, the following methods would be used as a means of obtaining the research data to be processed, analyzed and interrogated for the investigation. They serve as the Qualitative techniques or instruments for gathering research data and they includes:

- **One-on-one interview:** To have a more personal and a higher rate of responses, participants would be required to sacrifice time to complete a questionnaire or to answer interviews' questions. The interview questions would be questions of their specific situation within the context of the subject of discussions.
- **Semi structured and in-depth interviews**: The interview would be constructed in a semi structure but in an in-depth format: This would present planned questions and give more freedom for the interviewee to modify the wording and order of the questions. Also, with the questions being in-depth; the interview would be less formal and less structured, in which the wording and questions are not

predetermined. The semi structured interview guide would allow for flexibility in soliciting views, experiences, beliefs and suggestions of respondents about the subject matter.

- **Focus group discussion:** some members of these institutions would be invited to form focus groups and a series of structured discussion would be held with them to solicit for their experiences, opinions and knowledge about the subject matter, thus, registration, licensing and use of IP rights and R&Ds for commercial gains.
- **Questionnaires:** In the questionnaires; the questions asked would be in open and closed format. Open format questions that are without a predetermined set of responses would be administered. Closed format questions would also take the form of a multiple-choice questions
- **Observations:** Observers may simply begin with a blank notebook and write down everything that goes on. In this research, observers would begin with a list of categories of behavior to be noted. This note taking would ensure validity of the data collection and interpretation processes, to check data with members of context if possible, to weigh the evidence, and to check for researcher and subjects' effects on both patterned and outlying data.
- **Record keeping:** This is where already existing reliable documents and similar sources of information as a data source are used. There would be a look into books or any other reference materials to collect relevant data.
- **Organizational Documents analysis**: These are documents of all types that can help the research to uncover meaning, develop understanding, and discover insights relevant to the research problem (Merriam, 1988, p. 118). There will be an intensive analysis of any available document as a means of tracing change and development.

3.5 Data Collection Procedure

As already outlined above, there are different methods to collect and document data but in that, whatever method is used influences the content of the data. In some jurisdictions, the use of certain methods will produce data, which can be used for constructing a theory that is grounded in those data.

Qualitative interpretations are constructed, and data analysis techniques such as content analysis, grounded theory (Glaser & Strauss, 1967), thematic analysis (Braun & Clarke, 2006) or discourse analysis may be used to interpret the qualitative data. Grounded theory methodology places a strong focus on two " steps": sampling and analyzing data and it places less emphasis in on how to turn phenomena into data in the process, which means that there is less extensive advice on how to arrive at data to analyses once the field or case have been selected according to theoretical sampling.

The data to be collected in this research are data on arrangements for the implementation of Intellectual Property Management framework or practices for protection of any IP (specifically, Patent and copyright) within these institutions.

The data after being collected would be categorized into two categories (publicly-financed research and academic institutional IP data). This categorization is to allow the data to be interpreted according to the different categories as the mode and objective of operation of these institutions are different. The approach for the data gathering for this study would also be based on questionnaire administration which would be conducted on participatory or a two-way verbal data collection based. Systematic observation may also be considered if need be.

The two-way verbal approach will be done through single interviews (administering of written questionnaires) with the participants of the study and also asking of questions or stimulating discussions in group or focus group discussions in the context of their specific situations to the subject matter. The overall data collected will be documented by recording them and transliterating into texts or formats that can be analyzed.

Technology utilization (voice recordings, photography and filming) may be included in the medium for recording the data if found necessary. Where such technology is not used, the medium for documenting what was observed would be accomplished through observing the field notes written during and after the research activities.Content analysis for analyzing data forms part of the methods for analyzing the data in this research. Moreover, content analysis is seen as a method of analyzing data from interviews.

Grounded theory strategy for analyzing data is also based on content analysis and is specifically based on repeated field contacts that also allows returning to the field to collect more data and to adapt data collection to the needs and questions resulting from analysis of the data. Interview studies are in most cases based on meeting the interviewee once and often rely on an interview schedule for all interviews (Flick, 2014 pp. 400-404).

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meeting the interviewee once and often rely on an interview schedule for all interviews (Flick, 2014 pp. 400-404).

3.6 Analysis and Organization of Data

The analysis section of the research study analysis the data gathered by the administration of the the research questions or questionaires.

The research data that are produced during the survey are data such as narratives in the interviews, observations and descriptions in the field, and already existing materials, such as documents resulting from an institutional process. The collected data were presented in a form of texts or data to enable them be able to analyzed in a qualitative way. The data produced for the research of the study were analyzed by using this data analysis approach; data coding, categorization according to regions and institutions, and then finally extrapolating the data in context.In the coding and categorization approach, the technique is to develop codes through labeling and categorization and use categories for analyzing the data/statements produced or identified from the interview. In this context (coding and categorization), the data/statements will be taken out of their context and grouped with other bits of data or similar statements and put into various relations i.e. categories, subcategories, etc. This will also be applied to extract of documents or observations, photos, visual material or virtual data (Flick, 2014 pp. 400-412).

In the data analysis, an internal analysis approach was the basis of investigating the data in context within the sampled population. Narrative or conversation was analyzed. Within this context, visual materials or visual data were also applied.

The purpose for the data collection is to process the data and to produce an informative result that would enable a knowledge gap in the extent of institutional

arrangements for implementation of IP management framework for management and protection of IP generated, acquired or owned by the focus institutions of the study (i.e. publicly financed research and academic institutions) in Ghana to be effectively and efficiently mitigated. In his book "Research Methodology-Theory and Practice", Kothari (2016, p. 95) suggests that data analysis in qualitative research can occur before the data collection process has been completed.

Alternatively, existing documents like IP registration and licensing data from the institution in charge of IP registration and management, which is the registrar general office in Ghana also serve as documents sources for this qualitative data processing and analysis. These documents were in a format such as; notes, case reports, registration and licensing certificates, annual IP filling reports, official IP records and other expert opinions.

In the main analysis phase, confirmatory approach was adopted rather than exploratory approach. In this approach (confirmatory analysis), a clear hypothesis about the data are tested.

3.7 Ethical Consideration

This section refers to the correct rules, regulations and principles and moral responsibilities associated with the conduct of a particular research activity, especially during the administration of the questionnaires where researchers interact with respondents. During the research activities, researchers must know that they have a duty to respect the rights and dignity of the research participants.In this research/study, participants (researchers, interviewers and

interviewee) would be advised to abide by the moral principles and rules of conduct of study or research activities. The aims and objectives of this research would be communicated to participants in order for them not to feel misled, deceived or manipulated about the aims or the outcome of the research.

To check for validity of responses during the interview, observation as being part of the means of verification during the investigation process would directly or indirectly serve as a measure for benchmarking or counter checking the validity of the interview responses. While the observation technique records the actual behaviour, the interview would also record what respondents are saying or said/did or believes they will do or say thus, the statements of the conversation. Information provided by the respondents during and after the research would be kept confidential.

To reduce the likelihood of psychological, physical and mental harm, the questionnaires and respondent identity would be kept confidentially as requested by research principles/rules and also as may be demanded by the respondents.

Participants' consent would be obtained before being asked to provide data or information to assist in the investigation. Thus, Participants would be asked to provide informed consent prior to completion of the questionnaires, and they will be made aware that they have the right to withdraw their information at any time during the research study or survey.The questionnaires for the survey would not be too long. This is to ensure that the questionnaires can be completed in an appropriate time frame with putting much stress and pressure on the respondent.

3.8 Chapter Summary

Sometimes it becomes expedient to solicit for experts or professionals, or colleagues suggestions and further insight about how to take up research. Once the first case or material is identified, analysis of it is immediately undertaken to advance in the understanding of the issue. (Flick, 2014, p. 400).

Once the problem is identified, for which the lack of empirical analysis and theoretical explanation is noted, the next step is to find the context in which the study must begin. The next question is, where to find people in the situation more systematically. That is, where would potential participants for the issue be met, what kind of IP problems would be the most instructive as a starting point for developing a first understanding of the phenomenon, etc.

This research will seek to describe an in-depth understanding on the subject by relying primarily on words or documents, images and some behavioral observation (focus group discussions) on the subject of consideration and the population in context.

This research will enhance the various IP oriented professions/institutions to be well informed on IP rights management and other related issues to bridge the IP knowledge gaps within their institution's intangible asset value chain.

In producing data, there is a general statement like "All is Data" (Glaser 2002). Looking at textbooks of grounded theory gives the impression that explicit methods of data collection are less covered than how to analyze them. We find a sometimes-harsh debate about the status of data(collection) in the process of developing a grounded theory. This debate oscillates between the notion that

emerges in the field (Glaser 2002), that data are collected by using specific methods (Strauss 1987), and the idea that data are constructed or produced by the researcher in the field (Charmaz 2006). Beyond the epistemology differences in these notions, it seems obvious that researchers use methods for arriving at credible data (Flick 2014). Grounded theory methodology is not linked to a preferable method for collecting or producing data that is while it's adoption or inclusion like the other methods and concepts was necessary for this study.

IP is a valuable strategic intangible financial asset that is traded by institutions as an outcome of their novel innovations. Like any other resource, IPR needs to be managed and protected. Other benefits and potential risks are realized when IPR are managed efficiently or inefficiently respectively.

CHAPTER 4 DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1. Introduction

This chapter examines the extent of institutional arrangements for the implementation of IP management framework by publicly financed research and academic institutions in Ghana. The focus is on IP generation, protection from unauthorized exploitation like copying, stealing, non-ethical use and other wrongful exploitation. It also assesses the impact and challenges of implementing such a framework for management of the IP/IPRs generated or acquired by the institution.

As the assumption states; if the institutions of the study want to benefit economically and morally from their IP generated (patent and copyright), then it is imperative that they understand the need for, and implement an effective framework for the protection, management and commercialisation of IP for public benefit and economic gains. Moreover, if the institution does not have or implement any form of framework in this regard, then it is expected that it will not effectively manage its IP and as such will not secure protection for the IPRs involved and also may not be able to prevent unauthorized exploitation and unethical application or exploitation by third parties, and this forfeit commercial benefits from the outputs of research undertaken at the institution.

As indicated in the previous chapter, survey research design was chosen for this study because it is best served to answer the questions and in meeting the purposes of the study. Accordingly, the approach was to study and/or collect data from a group of people or items using a few people or items considered to be representative of the entire group, that is, only a part of the population is studied.

The findings from this are expected to be generalized to the entire population (Nworgu 1991) as cited by (Onyiuke ; 2007). Also the relative contribution of each stratum in the population is exactly its relative contribution in the sample (Nworgu 1991) as cited by (Odiaka and Obinne; 2010).Finally, data gathered from both primary and secondary sources are analyzed and organized into various headings and tables, with the purpose of responding to the research statement or problem and objectives stated in Chapter one.

4.2. Data Presentation

An interview schedule was the main data collection instrument for the study. Copies of IP policies for some of the institutions were also reviewed in the course of the interview process in addition to the questionnaire administration.

Three regions(Greater Accra, Ahsanti and Eastern region) were visited for the data collections as they formed the catchment area for the study.

The sample of the population of this study stood at a total of seven (7) respondents comprising Technology Research and Innovation / IP Directors of three (3) Technical Universities, three (3) Research institutions and one (1) IP Expert from the Kwame Nkrumah University of Science and Technology.

The stratification was based on publicly-financed technical universities, research institutions and a Science and Technology university. Within each section, selection of staff or employees to respond to the questionnaire was done through a nomination by the institution's head or administration.

Proportionate stratified sampling technique was employed for selection of the seven (7) respondent (Technology, Research and Innovation/IP Directors) representing the three (3) Technical Universities, three (3) Research institutions

(one from each focus region for each institution) and one (1) IP Expert Institution that is Kwame Nkrumah University of Science and Technology of Ghana (KNUST).

KNUST was selected as an expert or model institution to serve as a benchmark for the other universities in the area of IP Management and policy/legislation framework implementation in Ghana. It is the only university running a masters program on Intellectual Property in Ghana as of the year 2021. KNUST also happens to be the first Science and Technological University in Ghana which upon its creation has invented, discovered and created many novel inventions and works in Ghana.

The KNUST, Kumasi of Ghana has a mission of advancing knowledge in science and technology through the creation of an environment for undertaking relevant research, quality teaching, entrepreneurship, training and community engagement to improve the quality of life of Ghanaians.

KNUST to achieve its objectives and the mission, needs to have a policy on intellectual property to guide and protect the university's commercials, scientific and scholarly values emanating from the research staff, students, employees and other stakeholding organisations.

The analysis seeks to provide adequate information on the extent of implementation of an institutional IP management framework in the form of a legislation or a policy seeking to provide guidance in relation to ownership, distribution, commercialization of the technology, research and innovations developed by the focus institutions of the study.

4.3. Data Analysis and Interpretation

To better understand the implications of the data gathered by the questionnaires administered, it is also equally expected and a good practice that the survey data is analysed and interpreted. This section presents,analyses, and interprets the survey results of this study.

Through relevant research and other innovative activities, these institutions have sought to make significant contributions to finding smart and lasting solutions to the nations technological, economic and social challenges. However, most of these institutions lack policies or guidelines to protect the rights of researchers, innovators and creators in putting research findings and innovations on the domestic and foreign markets.

Table 1: Regional Composition of each Stratum of Institutions

S/N	NAME OF REGION	NAME OF PUBLICLY FINANCED TECHNICAL UNIVERSITY	NAME OF PUBLICLY FINANCED RESEARCH INSTITUTION	NAME OF EXPERT GROUP/ INSTITUTION
1	GREATER ACCRA	Accra Technical University	Technology Development and Transfer Center of Council for Scientific and Industrial Research-TDTC- CSIR	-

2	ASHANTI REGION	Kumasi Technical University	Building And Road Research Institute-CSIR	KNUST
3	EASTERN REGION	Koforidua Technical University	Mampong Centre For Plant Medicine Research	-

Source : Researcher's Data received from the Research and Academic Institutions.

Tables 1 identifies the three regions where the focus institutions were selected, and also the stratum or categorization of the institutions. In each region, one (1) research institution and one (1) academic institution (Technical university) were selected for the survey. As indicated in the population and sampling section of the Chapter 3, KNUST in the Ashanti region was added to serve as the expert or benchmark institution for the study, due to their experience in science and technology research development. .

In the Greater Accra region, Technology Development and Transfer Center of Council for Scientific and Industrial Research-TDTC- CSIR and Accra Technical University were selected.

In the Eastern region, Koforidua Technical University and Mampong Centre For Plant Medicine Research were selected and in the Ashanti region Kumasi Technical University, Building And Road Research Institute-CSIR, Kumasi and KNUST.

In all the institutions there was just one respondent to the questionnaire during the questionnaire interview.

4.3.1. Identifying the IP owned by the Institution (i.e. Generated, or Acquired IPs) and any Available IP/IPR Management Practices or Policies.

a) Research Institution

As shown in Tables 4. 1 and Table 4. 2, there are three selected Ghanaian publicly financed research institutions forming part of the selected institutions for this study. Among these three institutions are two Branches or Agencies of CSIR **(**Technology Development and Transfer Center of Council for Scientific and Industrial Research (TDTC- CSIR), Accra and Building and Road Research Institute of CSIR, Kumasi). The third institution is Ghana Center for Plant Medicine Research, Mampong. These three publicly financed institutions together with other existing public research institutions came into existence out of the establishment of the Ghana National Research Council in 1958 with the broad aim of coordinating scientific research to support the country's development (Yawson; 2002).

According to the survey these institutions have Technology Transfer Units or Offices as part of their mandates, as shown in Table 4. 3 below, to commercialise the results of research and the developed technologies to industry and also to transfer the knowledge of the developed technologies to the general public or the Ghanaian entrepreneurs for a continual, advance and improved research.

Table 2: Research Institutions Awareness on IP Generation, IP Policy and Technology Transfer Availability

S/N	Institution	Region	Institution produced IP	Institution IP awareness	IP Policy available	Availability of Technology Transfer Office/ an Office in charge of IP
1	Technology Development and Transfer Center of Council for Scientific and Industrial Research (TDTC- CSIR)	Accra	Yes	No	No	Yes
2	Center For Plant Medicine Research	Eastern	Yes	Yes	Yes	Yes
3	Building and Road Research Institute-CSIR	Ashanti	Yes	Yes	Yes	Yes

Source : Researcher's Data received from the Research Institutions.

From the survey results shown in Table 4. 2, all three institutions produce some form of IP but only two, that is, (i) Center For Plant Medicine Research, Mampong and, (ii) Building and Road Research Institute-CSIR, Kumasi responded that their researcher scientists and staff/employees are aware of the institution's IP generated or produced and they are also familiar with the institution's IP Policy.

TDTC-CSIR, Accra, respondent responded that they are aware that their parent institution, as per their mandates and business operations/activities generate some form of IP but they as an agency are not aware of the IP Policy documented by the parent institution.

TDTC-CSIR depends on the provisions in the Ghana National IP Policy and to be precise, the Ghana National Copyright policy (Copyright (Amendment) Act,

2009 (Act 788), adopted on 31st December, 2009 and Copyright Regulations, 2010) for the protections of its research findings publications.

Table 3: Research Institutions IP Owned, Managed, and IP Staff with IP Background

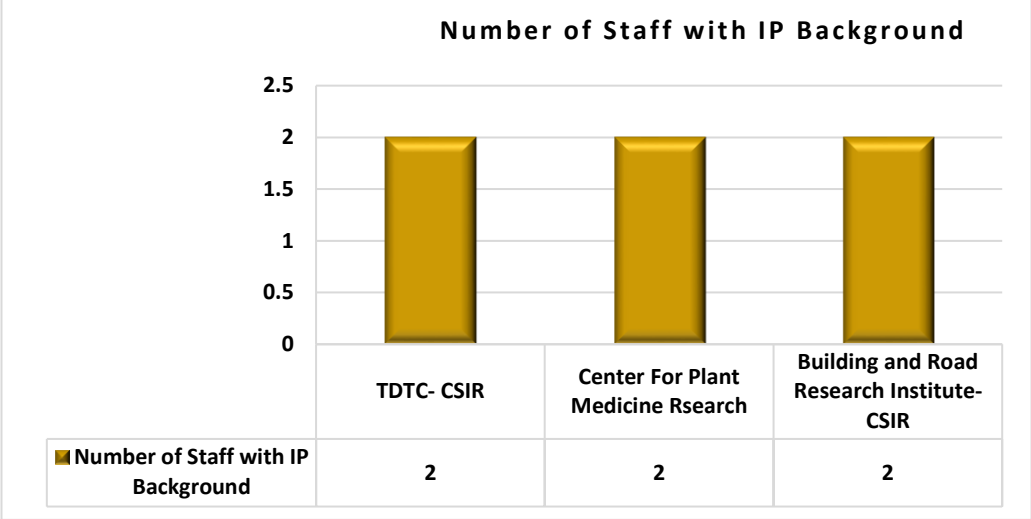
S/N	Institution	IP owned/ Generated	Office in charge of IP Management	Number of IP Staff with IP Background
1	(TDTC- CSIR)	Copyright	IP Office of CSIR Head Office	Two (2)
2	Center For Plant Medicine Research	Copyright, Patent, Trade marks	IP Unit	Two (2)
3	Building and Road Research Institute-CSIR	Patent Industrial Designs	IP Policy / Office	Two (2)

Source : Researcher's Data received from the Research Institutions.

The data in table 4. 3 and figure 4. 1 reveal that all the three research institutions have two staffs each with IP background. According to the respondents, their IP knowledge was acquired through IP workshops, sensitization programs, seminars, IP related training and also through taking part in the WIPO online IP courses. As depicted in table 4. 3), each institution generates some form of IP rights and they have an office in charge of IP administration and other IP related issues. These IP staff work with the office dedicated to take charge of IP management, protection

and the conduct of other IP activities like sensitization, training and other IP related activities and programs within the institution.

Figure 1: A Graph of Number of Staff with IP Background in each Research Institutions



Source : Researcher's Data received from the Research Institutions.

Table 4. 4 shows investigations on the forms of Policies for IP legislations; it reveals that TDTC- CSIR has no dedicated IP Policy but relies on the provisions in the National Copyright Amendment Act, 2009 for its research findings publication protection. The Ghana Center for Plant Medicine Research, Mampong and the Building and Road Research Institute-CSIR, Kumasi each have some form of IP policy for managing the institution's IP assets. Except TDTC-CSIR, the Ghana Center for Plant Medicine Research, Mampong and Building and Road Research Institute-CSIR, Kumasi have procedures for implementing their IP policies.

The Ghana Center for Plant Medicine Research, Mampong has an office responsible for IP management and a draft IP Policy which is in a developing stage as of 2021.

Even though the draft policy has not yet been approved by the Management Board of the institution, it is still being used for managing the institution's IP assets.

Table 4: To investigate the forms of Policies for IP legislations

S/N	Institution	Kind of Policy available	Forms of Intellectual Property Legislation/Policies available	Office for administration of the Policy	How is the Policy implemented in the institution
1	TDTC- CSIR	No IP Policy	Relies on the National Copyright Amendment Act, 2009	IP Office of CSIR Head Office	N/A
2	Center For Plant Medicine Research	IP Policy available	IP Policy	IP Unit	By IP Policy implementation committee.
3	Building and Road Research Institute-CSIR	IP Policy available	IP Policy	Technology Transfer office	Submission of documents to CSIR head office

Source : Researcher's Data received from the Research Institutions.

Table 5: Research Institutions IP Disclosure, Ownership and Benefit Sharing scheme

S/N	Institution	Region	Disclosure to the institution of new IP	Ownership of IP by the institution	Ownership of IP by the researchers	Benefit sharing with researchers upon commercialization
1	TDTC- CSIR	Accra	N/A	N/A	N/A	N/A
2	Center For Plant Medicine Research	Eastern	Yes	Yes	Yes	Yes
3	Building and Road Research institute-CSIR	Ashanti	No	Yes	No	No

Source : Researcher's Data received from the Research Institutions.

According to the survey, as shown in Table 4. 5; apart from TDTC- CSIR, that didn't discloses their status in regards to (Disclosure, Ownership and Benefit Sharing scheme) as must be found or declared in the institution's IP Policy statement, Building and Road Research institute discloses ownership of IP produce in the institution whereas the Ghana Center for Plant Medicine Research, Mampong also made some disclosures as indicated in the table.

This survey responses by the respondents of these three research institutions, especially the responses of the CSIR Branches or Agencies inclusively exposes the vast gap in the institution's determination or declaration on IP ownership, commercialization and benefit sharing processes in Ghana. Accordingly, it points out the need for the research institutions to be very conversant with the IP laws and Policies in Ghana.

b) Academic Institution

The Ghanaian Higher Education or Academic Institutions are putting much effort to lead the country into industrial growth (Yawson; 2002). Further to this, all the Higher Academic Institutions like the Universities including the three Academic Institutions of this study are commissioning Technology Transfer Offices as being directed by the Ghana National Research Council (Yawson; 2002).

Data from the Academic Institutions survey reveals that the Expert/Benchmark institution (KNUST) is aware of the IP generated by the institutions researchers (staff and students) and other partner agencies as shown in Table 4. 6. According to the data, KNUST utilizes IP Policy developed and approved by the 346th Regular meeting of the university Academic Board for its IP administration and management. The university is currently running an IP Masters Program to develop IP professionals to improve Ghana's national IP proficiency with the support of ARIPO/WIPO.

According to the respondent, as depicted in Table 4. 6, the university is not having a very active and efficient operating Technology Transfer Unit for the administration and management of IP issues in the school. She lamented that information relating to IP is found in the archives of the schools of Graduate Studies which has a limited audience. According to her, even though members of the university are aware of IP generated or produced in the school, there is still a gap applying IP/IPR practices in the school.

Table 6: Academic institutions Awareness on IP Generation, IP Policy and Technology Transfer Availability

S/N	Institution	Region	Institution produce IP	IP Policy awareness	IP Policy availability	Availability Technology Office/an charge of IP
1	Accra Technical University	Accra	No	No	No	Yes
2	Koforidua Technical University	Eastern	Yes	Yes	Yes	Yes
3	Kumasi Technical university	Ashanti	Yes	Yes	Yes	Yes
4	KNUST	Ashanti	Yes	Yes	Yes	No

Source : Researcher's Data received from the Academic Institutions.

Table 4. 6 shows that unlike Accra Technical University, all the respondents for the academic institutions including KNUST confirmed that their institution generates some form of IP and also have Technology Transfer Offices.

Table 7: Academic institutions IP Owned, Managed, and IP Staff with IP Background

S/N	Institution	IP owned/ generated	Office in charg I of Management	Number of I Staff with I Background
1	Accra Technical University	N/A	Research, Innovation, Publication and Technology Transfer	N/A
2	Koforidua Technical University	Copyright Patent Industrial Design	Technology and Innovation Research Directorate of Research	Four (4)
3	Kumasi Technical University	Copyright Patent Industrial Designs	Center for Research and Development for Technology Incubation	Two (2)
4	KNUST	Copyright Related rights Patent Industrial Designs	Technology Transfer Office	One(1)

Source : Researcher's Data received from the Academic Institutions.

From Table 4. 7; it is evident that Accra Technical University does not prioritized monitoring of IP issues. The institution do not have records of the institution's IP generated/developed or acquired, they have no dedicated office for IP management and as such no dedicate staff with IP background to manage the

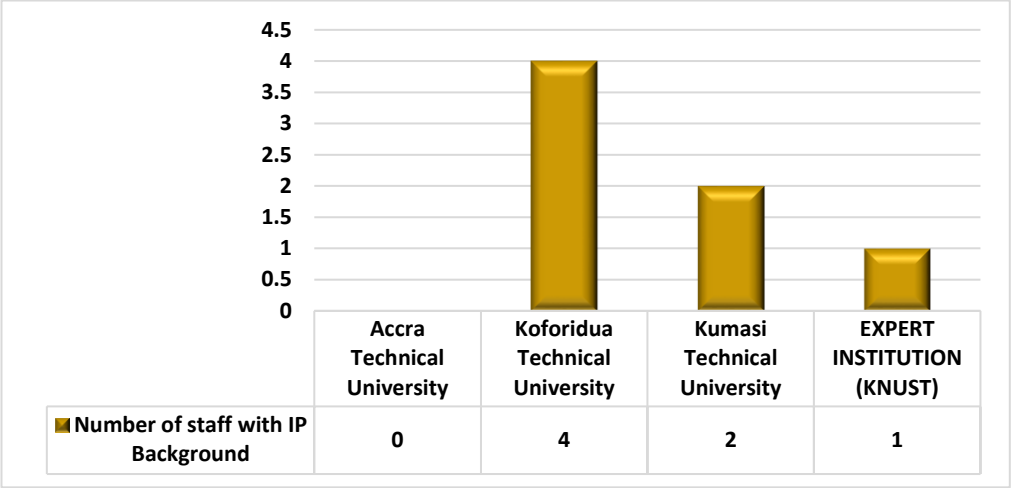
institutions IP owned (i.e. IP generated or acquired) . IP related issues are referred to the Research,Innovation, Publication and Technology Transfer office.

Koforidua Technical University generates IP in the form of copyright, patent and industrial designs. It also utilizes the Technology and Innovation Research Office/Directorate of Research as the office dedicated to manage the IP generated by the University.

Kumasi Technical University also generates some forms of IP (i.e. copyright, patent and industrial designs) and utilizes the Center for Research and Development for Technology Incubation office as the office for IP management and other IP related activities. Lastly, KNUST also generates the following IP; Copyright , Related rights, Patent, Industrial Designs. The university utilizes the Technology Transfer Office as the office for managing the university's generated IPs, conducts IP training for staff and also takes charge of other IP related issues.

Figure 4. 2 shows the number of staff working with the designated IP Offices with IP background for each of the academic institutions of the study. Excluding Accra Technical University that does not have staff with IP background, the others have an IP background, as shown in Figure 4. 2.

Figure 2: A Graph of Number of Staff with IP Background ineach Academic Institutions



Source : Researcher's analysis of data received from the Academic Institutions.

According to the survey as shown in Table 4. 8; Accra Technical University has no dedicated IP Policy for administering and managing its IP Assets. KNUST, Koforidual Technical University and Kumasi Technical University each have some form of IP policy for managing the institutions IP Assets. Apart from Accra Technical University, KNUST, Koforidual Technical University and Kumasi Technical University have some laid down procedures for implementing their IP policies.

Table 8: Investigating forms of Policies for IP legislations by the Academic Institutions

S/N	Institution	Kind of Policy available	Forms of Intellectual Property Legislation	Office for administration of IP Policy	How is the Policy implemented in the institution
1	Accra Technical University	N/A	N/A	N/A	N/A
2	Koforidual Technical University	I P Policy	IP Policies	Research Directorate	is based on Institutions IP Policy Framework
3	Kumasi Technical University	IP Policy	IP/ Commercialization Policy	Center for Research & Development for technology Incubation	Through an IP Committee
4	KNUST	IP Policy	KNUST IP Policy	IP Unit, KNUST (IPUK)	Through IP committee, action plan, and appointment of IP administrator

Source : Researcher's Data received from the Academic Institutions.

Apart from Accra Technical Universities who doesn't have IP policy, the objective and purpose of the IP policies of KNUST, and Kumasi and Koforidua Technical Universities have some similarities and commonalities and their

ultimate goals are to ensure protection of inventions and works created in the institution and/or with the institution resources.

Table 9: Academic Institutions IP Disclosure, Ownership and Benefit Sharing scheme

S/N	Institution	Region	Disclosure to the institution of new IP	Ownership of IP by the institution	Ownership of IP by the researchers	Benefit sharing with researchers upon commercialization
1	Accra Technical University	Accra	N/A	N/A	N/A	N/A
2	Koforidual Technical University	Eastern	Yes	Yes	Yes	No
3	Kumasi Technical University	Ashanti	Yes	Yes	Yes	Yes
4	KNUST	Ashanti	No	Yes	Yes	Yes

Source : Researcher's Data received from the Academic Institutions.

Table 4. 9 shows that, with Accra Technical University and KNUST, there is no disclosure of new IP developed in the institution, meanwhile Koforidual Technical University and Kumasi Technical University disclose ownership of IP produced in their institutions. Table 4. 9 also reveals that IP Policies of Accra and Koforidua Technical University do not have clear provisions on Benefit Sharing with researchers, students, staff, and employees upon commercialization of the institutions IP produced.

4.3.2. Identifying The Availability and Status of Implementation of Intellectual Management Framework (IPM) Framework in the Institutions.

a) Research Institution

Table 4. 10 shows that Building and Road Research Institute-CSIR, Kumasi offers clear IP registration services in the institution. Whereas TDTC- CSIR and Center for Plant Medicine do not have such any registration services. Members of the three research institutions (Building and Road Research Institute-CSIR, Kumasi, TDTC- CSIR and Center for Plant Medicine) to some extent understand IP related issues as it relates to their various institution's activities . They also understand their obligations under the implementation or use of the IP M framework . and lastly, Supervisors/Researchers of the three research institutions are aware of their institution's IP policies and IPR management practices as is practice by each institution.

Table 10: Research institutions IPM Understanding, Awareness and Implementation Obligation

S/N	Institution	Region	Awareness of Institutions IP registration services	Members Understanding of IP related issues as it relates to the institutions activities	Members obligations under the implementation or use of the IP M framework Understood	Supervisors/Researchers aware of the institutions IP policies and IPR management practices.
1	TDTC- CSIR	Accra	No	Understand	Understand. CSIR-TDTC have no IPM Framework. But	Yes

					uses Ghana's IP laws /regulations	
2	Center For Plant Medicine Research	Eastern	No	Understand to some extent	Understand to some extent	Yes
3	Building and Road Research institute-CSIR	Ashanti	Yes	Understand to some extent	Understand to some extent	Yes

Source : Researcher's Data received from the Research Institutions.

Table 11:Research institutions IP Ownership scheme

S/N	Institution	Region	IP Ownership Scheme
1	TDTC- CSIR	Accra	Ownership reside with the institution
2	Center For Plant Medicine Research	Eastern	Ownership reside with the institution
3	Building and Road Research institute-CSIR	Ashanti	Ownership reside with the institution

Source : Researcher's Data received from the Research Institutions.

According to the survey data in Table 4. 11, ownership of the IP/IPR mostly resides with the institution when the IP/IPR is made or created by staff, and students or employees of the institution.

Table 12: Research institutions IP Benefit Sharing and Motivation Scheme

S/N	Institution	Region	Employee/student involved in inventions entitled to share in revenue/incentives emanating from those inventions	on what basis are the incentive shared	Institutional Motivation/ drivers for implementation of the management system
1	TDTC-CSIR	Accra	N/A	N/A	N/A
2	Center For Plant Medicine Research	Eastern	Yes	Based on a writing agreement	To protect the institution IP rights and also to bring about equity in the benefit of commercialization of the IP right when applicable
3	Building and Road Research institute-CSIR	Ashanti	No	N/A	Use the IP system for future protection of IPRs within CSIR

					Availability or contribution to IPRs generation aids in staffs promotion

Source : Researcher's Data received from the Research Institutions.

In relation to employee involved in invention benefit sharing entitlements, Table 4. 12 shows the results of the survey that TDTC- CSIR and Building and Road Research institute-CSIR, Kumasi each do not have any dedicated provision unlike Center for Plant Medicine Research who do have documented provision in their IP policy instrument including some employe/ researchers Motivation Scheme.

b). Academic Institution

Table 13: Academic institutions IPM Understanding, Awareness and Implementation Obligation

S/N	Institution	Region	The Institutions IP registration services awareness	Understanding of IP related issues as it relates to the institutions activities	Members obligations under the implementation or use of the IP M framework Understood	Supervisors/Researchers aware of the institutions IP policies and IPR management practices in the institution

1	Accra Technical University	Accra	No	Understand to some extent	Understand to some extent	No
2	Koforidua Technical University	Eastern	No	Understand to some extent	Understand to some extent	Understand to some extent
3	Kumasi Technical University	Ashanti	Yes	Understand to some extent	Understand to some extent	Yes, (To some Extent)
4	KNUST	Ashanti	No	Understand to some extent	Understand to some extent	Yes, Understand to some extent

Source : Researcher's Data received from the Academic Institutions.

The data in Table 4. 13 reveals that only Kumasi Technical University among the four academic institutions of this study employs active IP registration service for registering IPs generated or produced in the university. Accra Technical University, Koforidua Technical University and KNUST, do not employ or have any active registration services for registering the various IP generated in university by members and other stakeholders of the university.

Also, the survey reveals that all the members of the four institutions to some extent understand IP as it relates to their functions in the university. This means that all the active or functional members of the four universities of this study understand their individual obligations under the application of the IPM framework or IP policy to some extent.

Unlike Accra Technical University, Supervisors/Researchers from the other institutions are also aware of the institution's IP Policies and IPR management practices to some extent.

Table 14: Intellectual Property Ownership

S/N	Institution	Region	Work Created by Staff/ Employee	Work Created by Faculty	Work Created by Student	Work Created by the institution
1	Accra Technical University	Accra	N/A	N/A	N/A	N/A
2	Koforidua Technical University	Eastern	-	-	-	Ownership reside with the institution
3	Kumasi Technical University	Ashanti	-	-	-	Ownership reside with the institution

						when all resources are fully provided by the institution.
4	KNUST	Ashanti	Staff/employee owns the invention when IP is not created as commissioned work prepared by an employee within the scope of his or her employment or as a specific assignment	When developed by the faculty with faculties own resources and the IP is not developed in accordance with the terms of a sponsored research or other	Student ownersh IP is approved only when there is no significant use of funds or facilities administered by KNUST	Institution when resources are committed by the institution Or Upon agreement with staff and employees

			by KNUST.	agreements .		

Source : Researcher's Data received from the Academic Institutions.

According to Table 4. 14, KNUST, and Koforidua Technical Universities each have documented provisions on ownership. These provisions in one way or the other state that a full or partial ownership resides with the institution, staff or employees, researcher, innovators, technicians and funding agencies/partners whenever IP is generated. The proportion of the benefit sharing is guided, or determined by the extent of funding or resource commitmented by the parties. KNUST seems to have a clear provision in their IP Policy document regarding ownership and Benefit Sharing provisions,as illustrated in Table 4. 14.

Table 15: Entitlement to Share in Revenue/Incentives

S/N	Institution	Region	Employee/Student inventors entitled to share in revenue/incentives emanating from inventions	on what basis are the incentive shared	Institutional Motivation/drivers for implementation of the management system
1	Accra Technical University	Accra	N/A	N/A	N/A

2	Koforidua Technical University	Eastern	Yes	Commission. (Lump sum payment)	IP as a tool for enhancing visibility of the University
3	Kumasi Technical University	Ashanti	Yes	Based on a writing agreement	Staff promotion considers imputs to IP products/rights
4	KNUST	Ashanti	Yes	Based on a writing agreement as KNUST IP policy on benefit sharing stipulates	Support of the Vice Chancellor and the University's Management Board

Source : Researcher's Data received from the Academic Institutions.

As indicated in the KNUST Policy (Kwame Nkrumah University of Science and Technology (2015)), regarding ownership, the policy states that; ownership of IP made or created by staff and students of KNUST shall reside with the inventor or creator of such IP provided that:

1. The IP is not developed in accordance with the terms of a sponsored research or other agreements
2. The IP is not created as commissioned work prepared by an employee within the scope of his or her employment or a specific assignment by KNUST
3. There is no significant use of funds or facilities administered by KNUST.

4. IP developed in accordance with the terms of a sponsored research or agreement will be determined in accordance with the terms of such an agreement.
5. Copyrightable works created as commissioned work or as a work prepared by an employee within the scope of his or her employment, or pursuant to a written agreement with KNUST provided for the transfer of any IP or ownership to KNUST will be owned by KNUST.
6. IP developed by faculty, technicians, staff, students and other participants in KNUST programmes, including visitors, with the significant use of funds or facilities administered by KNUST will vest with KNUST and lastly;
7. In the absence of a third party agreement to the contrary, the ownership and associated rights of IP generated from a research project funded by any publicly funded research agency will be vested in the University.

According to the survey data presented in Table 4. 15, in the area of "Entitlement to Share in Revenue/Incentives", all the Academic Institutions with the exception of Accra Technical University, employee/student researchers and innovators are entitled to share in Revenue/Incentives emanating from any research outcomes and invention conducted in the school of which they partially or totally contributed in terms of funding and resource commitments.

The Accra Technical University does not have any motivational factors or drivers that foster the institution's implementation of the IPM framework or Policy.

As provided in Table 4. 15, each of the institutions have some kind of documented benefit sharing or rewarding criteria which informs the benefit sharing aspect of policy agreement.

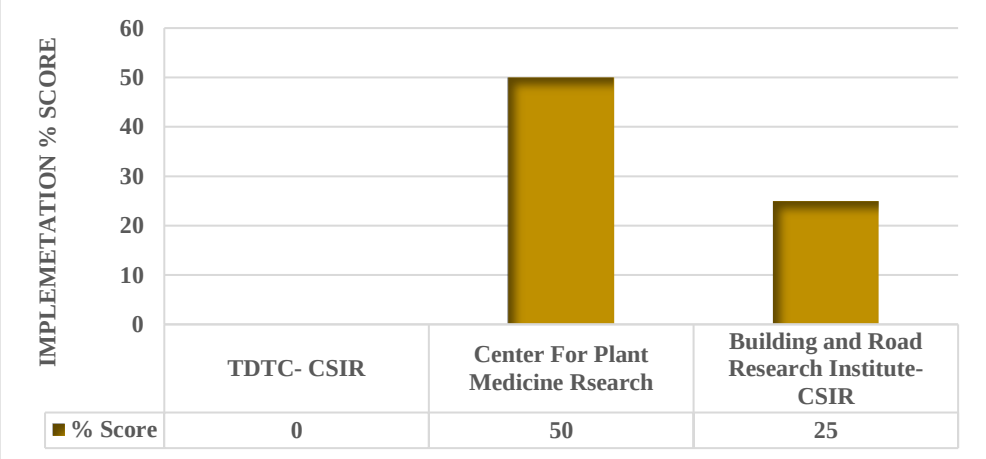
Upon agreement, payments are made either on commission basis, lump sum payment, or as part of salary payment. According to the data, Koforidua Technical

University, Kumasi Technical University and KNUST each have some institutional motivational factors or drivers that foster the institution's implementation of the IPM framework or Policy.

4.3.3. Identifying the Effect of Implementation of IPM Framework

a) Research Institution

Figure 3: Research Institutions IPM implementation Rate/Score



Source : Researcher's Data received from the Research Institutions.

Figure 4. 3, shows the Research institution's score on the rate at which the IPM framework implementation has had on the institution (i.e either Very Successful, Successful, Good, Average, or Poor), TDTC-CSIR responded Not Applicable . whereas, Center for Plant Medicine Research, Mampong and the Building and Road Research Institute-CSIR, Kumasi responded that the impact of IPM framework implementation on their various institution's activities and operations are Good (50% score) and Poor (25% score) respectively.

Table 16: Strategies and Challenges of IPM Framework Implementation by Reseserch Institutions

S/N	Institution	Region	Implementation Challenges	Registration Guidelines Easiness	Strategy to successfully IPM implement framework
1	TDTC- CSIR	Accra	N/A	N/A	N/A
2	Center For Plant Medicine Research	Eastern	Yes. In adequate Staff knowledge on IP issues	Easy to understand	IP/IPRs Expertise development and provision of relevant tools, registration procedures and incentives.
3	Building and Road Research Institute-CSIR	Ashanti	Yes. Lack/or limited of IP expertise	Not too easy to understand	

Source : Researcher's Data received from the Research Institutions.

Table 17: The Extent of IPM Impact on Research Institutions Activitiesand Operations

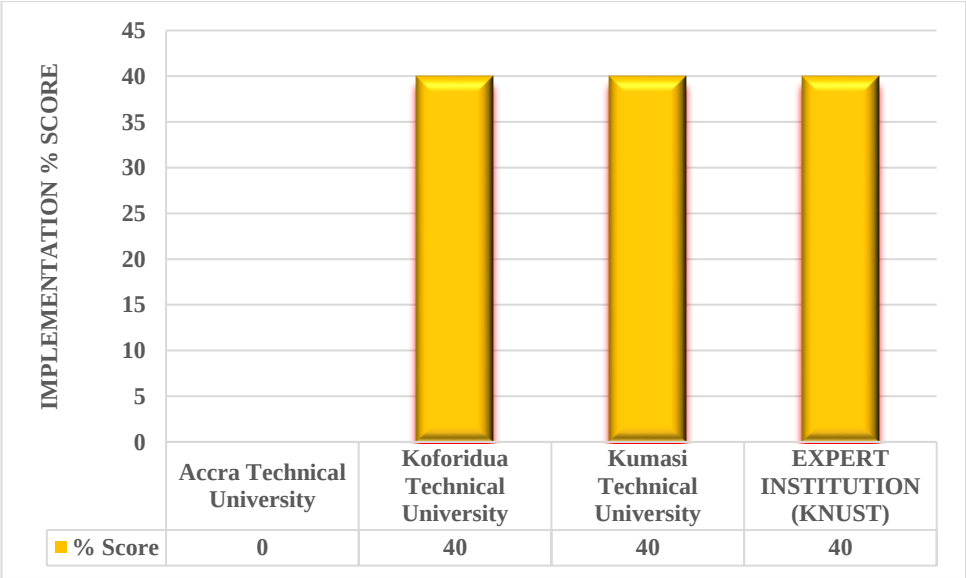
S/N	Institution	Region	The Extent of IPM Framework implementation impact on the institution's activities and operations
1	TDTC- CSIR	Accra	N/A
2	Center For Plant Medicine Research	Eastern	Protection of the institutions IP rights (basically traditional medicine products). Inventors benefit from their inventions.
3	Building and Road Research Institute-CSIR	Ashanti	To a very high extent in terms of product varieties invented/ novel industrial designs.

Source : Researcher's Data received from the Research Institutions.

For the institutions showing the extent of impact of the IPM framework implementation on the institution's activities and operations, Table 4. 17 reflects on the responses of the institutions.TDTC- CSIR remains neutral since they do not apply IP management and as such do not implement any IPM framework/policy of any kind in their academic activities and operations.

b) Academic Institutions

Figure 4: Academic Institutions IPM Implementation Rate/Score



Source : Researcher's Data received from the Academic Institutions.

According to Figure 4. 4, attempting to score the universities on the rate of impact of the IPM framework implementation on their activities and operations (i.e either Very Successful, Successful, Good, Average, or Poor) , Accra Technical University responded as Poor with no score. This attests to the fact that they do not prioritize IPM framework/Policy implementation in their academic endeavors. Unlike Accra Technical University, Koforidua Technical University, Kumasi Technical University, and KNUST responded to the rate of IMP framework implementation as Average with a score of (40% score) for each of the institutions.

Table 18: Strategies and Challenges of IPM Framework Implementation

S/N	Institution	Region	Implementation Challenges	Registration Guidelines Easiness	Strategy to successfully implement IPM framework
1	Accra Technical University	Accra	N/A	N/A	N/A
2	Koforidua Technical University	Eastern	There are challenges especially corporation	Guideline not standardized, so members do not find it easy	There should be sensitization programs to educate staffs
3	Kumasi Technical University	Ashanti	The office in charge of IP is not well resourced	Yes, the policy outline all the process involved	Staff sensitization should be undertaken to stir up interest in IP generation
4	KNUST	Ashanti	Lack/Little commitment by staffs & employees	N/A	IP awareness creation, strong Academia Management

					Support and strong linkage with industry to promote commercializati on.

Source : Researcher's Data received from the Academic Institutions.

The data presented in Table 4. 18 revealed that Accra Technical University responded as "Not applicable" to IPM framework implementation challenges, registration guidelines easiness and strategies to successfully implement IPM framework. On the other hand, Koforidua Technical University, Kumasi Technical University, and KNUST respondents answered that there exists some challenges with the implementation of the IPM framework. Concerning their responses to strategies to successfully implement IPM framework, they concluded that there should be IP awareness creation, sensitization programs to educate staff, strong support from management and good institutional linkages with industry to promote commercialization and technology diffusion.

Table 19: Extent of IPM Impact on Academic Institutions Activitiesand Operation.

S/N	Name of Institution	Region	The Extent of IPM impact on the institution's activities and operations
1	Accra Technical University	Accra	N/A
2	Koforidua Technical University	Eastern	It would strengthen the activities of the University
3	Kumasi Technical University	Ashanti	It will help in staff motivation to develop IPs and the institution will benefit in terms of money and good public image and rating
4	**EXPERT INSTITUTION (KNUST)**	**Ashanti**	**Positive impact on the university image in the area of technology and other inventions**

Source : Researcher's Data received from the Academic Institutions.

As universities elsewhere have benefited from the implementation of IP Policy of a sort, it would be a ground-breaking adventure to the academic and research institutions of this study to also follow suit.

According to the survey as indicated in Table 4. 19, with the exception of Accra Technical university, all the other universities including KNUST have experienced a positive institutional outlook since the implementation of some kind

of IP Policy and the practices of it for managing, protecting and commercializing the IP/IPRs generated in the institution.

4.4: Chapter Summary

This chapter discussed the true state of the extent of implementation of IP management frameworks or legislative structure by Ghana's publicly-financed research and academic institutions. The discussion was within the context of the protection of research findings/outcomes, technical invention, exploitation of IP/IPRs in research and inventions, transferring the findings to industries or entrepreneurs, or bringing it to the market/industrial domain for commercializing.

As revealed by the analysis presented in Tables 4. 2 and Table 4. 6, the focus institutions are all familiar with the concepts of technology transfer and some even have Technology Transfer Offices as part of the units or departments of the institution, with an appointed officer or staff or IP trained professional manning the unit/department. Regrettably, not all the institutions are familiar with IP Policy and its implementation. Moreover, those who to some extent have some form of knowledge like Kumasi Technical University (as shown Table 4. 13) who are aware of IPRs and IP Policies to some extent, unfortunately do not put priority in implementing and practicing it well enough to influence the institution's research and innovative culture.In the last few years, many of the institutions especially the science and technology and technical institutions have shifted their focus to technological inventions leading to creating innovative student entrepreneurs and business hives and simultaneously they commercialized the new technologies research outcomes. But if competitors start jockeying to grab the inventions, these innovative institutions find themselves in a very unsecured position. Example of

these situations are; The Koforidua Technical University in the eastern region of Ghana who developed a palanquin with wheels for the Chiefs of Koforidua. The Koforidua Technical university refused to patent it or register it in their name. This led to a dispute between the Koforidua Technical University and the Chiefs who are claiming ownership of the technology after filling for patent protection as their own invention. The Head of the Chiefs claims that they gave some token to the Kofiridua Technical University and that supposedly should serve as payment for the work done by the technology and innovation department of the Koforidua Technical University . Another example is KNUST and Kumasi Technical University. KNUST, and the Kumasi Technical University who are also in dispute over the true inventor thus initiator and owner of a machine for preparing one of the Ghanaian local dishes (Fufu pounding machine). The technology students of these two universities made technological research simultaneously developed some solutions for processing some of the Ghanaian local dishes. A famous machine was developed by these students out of this ingenuities, that is, the Fufu pounding machine of which two institutions refused to file for patent registration for the novel invention. Now the contention is that each of the school is claiming for ownership of the invention and this is happening because each of them do not prioritized the registration and protection or securing of the IP the students and researchers generates in both schools. According to the analysis of this study, to overcome this threat, application of IP Management framework by the institutions for protecting the IP/IPRs would be one of the best solutions.

According to the response of some of the institutions, Ghana's already instituted legal and structural IP frameworks/Policies should be strengthened to effectively

tackle IP infringements practices may it be on a deliberate manner or out of ignorant in order to generate creativity and create competition with the various research, and science and technology development institutions.

Applying, prioritizing and implementing IP Policies and IPR management framework to manage the IPRs generated protects institutions innovations and creative works from copying, manufacturing and selling without permission of the owner. This must be encouraged by the authorities and institutions dedicated for that purpose in the country.

CHAPTER 5 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

Intellectual Property Rights (IPRs) are one of the principal means through which companies, creators and inventors can capitalize to generate returns on their investment in innovation and creativity. This study sought to build on the efforts of the many advocacy groups, organizations and institutions like WIPO, ARIPO and WTO to strengthen the protection and enforcement of IPR in the developing and least developed countries. The study complements these efforts by providing an update on the true state of preparation and measures being put in place by the various institutions who are in one way or the other in the group that produces or generates IP or those that engage themselves in IP related activities, in Ghana.

The study has focused on the extent of implementation of IP management framework, policies, legal framework or other practices that are undertaken with the aim of improving IPR management, protection and enforcement, and structures put in place by the various institutions to reward creaters and inventors. The IP management framework should enhance the interest of more innovators or scientists to innovate and create new technologies needed for the general well being of mankind and for an overall economic growth in the area of technologies and innovations.

According to the analysis of the data gathered from each institution, it can be testified that the objectives of the study have been met. A true picture of the extent of implementation of a framework for IP management by the publicly-financed institution with emphasis on the research and academic institutions has been studied.

- The findings indicate that in most of the institutions, there is lack of clear policies in the area of IP administration and management and this has given rise to inadequate staff knowledge on the instution's IP ownership and other IP issues .

- The analysis revealed that (Table 4. 2 and Table 4. 6), even though most of the focus institutions are all familiar with the concepts of technology transfer and some even have Technology Transfer Offices with an appointed officers or IP trained professional manning the office, not all the institutions have or are familiar with IP Policy and its implementation.

  Moreover, those who are aware of IPRs and IP Policies to some extent, like Kumasi Technical University (as shown Table 4. 13), unfortunately do not put priority in implementing and practicing it well enough to influence the institution's research and innovative culture.

  The research was conducted within the context and background in which Ghana, an imerging economy with vibrant technology hubs and incubation centers is confronted with the challenges of influx of counterfeit products, IP infringement and poor IP portfolio management.

  The assumption of the study is based on an observation (i.e. simple inductive assumption). It stated the expectations concerning the relationship between the variable in the research ploblems. It stated clearly the expected relationship between the variables of this survey and defined those variables in operational, measurable terms. According to the available data gathered within the institutions of study, it was clearly proven that, the institution that benefits economically and morally from the institution's IPs generated or developed (especially, patent and copyright), are those that understand the need for implementing an effective

framework for the protection, management and commercializing IP and as such practicing it. Moreover, it was revealed that these institutions are able to effectively manage their IP and as such are able to also secure protection for the IPRs involved in their activities. Further more, they are also able to prevent unauthorized exploitation and unethical application or exploitation of their works by third parties. This therefore enhances them to secures commercial benefits and other incentives from the outputs of research, inventions and innovational activities undertaken.

IPRs in practical terms, are directly linked to the national and international trading system through the production and distribution of new and authentic goods and services from which every citizen benefits. Due to this, an optimal and economically efficient IP/IPR infrastructure and policies or framework which covers the legal recognition, registration, utilization, and effective and adequate enforcement of all forms of IPRs in both the Physical and through the e-commerce spaces must be seen as a must to implement and immensely beneficial to be chartered into.

5.2. Discussion

The protection of IP must become a consideration to researchers who seek to protect their creations from others who use creative works or findings that may be in the public domain. The general principle of IP is to encourage the sharing of knowledge, foster innovation and motivate researchers. However, the practice where researchers keep their findings and innovations to themselves needs to be discouraged for mankind's common good. Likewise, the act of copying and stealing others intellectual property must be discouraged. These are some of the

reasons why IP must be managed or protected with the implementation of a policy or management framework of a sort in the various institutions where they have been created, traded, transferred and commercialized. However, to achieve this mission, there is the need to have a Policy on IP to guide the Research and Academic Institutions and also Research and Technology Funding Agencies.

Without IP policies or legislative documents, most of the research outcomes and novel creations, inventions and works may remain on the shelves for many years denying the researchers, creators, inventors the rewards and recognitions they deserved for their outstanding contributions to the institution and the economy in general.

The general principle of applying IP management framework or policy is to encourage and enhance the sharing of new knowledge, skills, new ideas ,promote and foster innovations and then also to motivate owners behind those novel contributions or works.

According to further interview with some of the respondents (KNUST, Kumasi CSIR, and Accra Technical University), the creative scientists and professionals are frustrated due to hierarchies of authority, lack of delegation and mistrust in sharing information within their institutions. The study outcomes suggest that the most critical barriers facing successful implementation of IP Policies or IP Management framework and technology commercialisation in Ghana today can best be categorized as: political, financing, management, marketing / commercialisation and infrastructure. Addressing these barriers, would contribute significantly to improving the inventive and creative capabilities in the various

research, academic and technology development institutions in Ghana; and it will improve and give meaning to the technology commercialisation climate in Ghana.

According to the expert who responded for the expert institution, until 2001, Ghana had no explicit National Science Policy, so the IP/IPR introduction was not done within any proper policy framework. This actually contributed to the poor planning before the implementation. She said the knowledge level on IPR among scientists even after years of sensitization amidst some of the institutions venturing into commercialization is still very low. Most technologies developed found their way to the end users without any gain to the developers and sometimes also to the institution itself. Research Scientists did not see the reason why they had to commercialize their research findings, inventions and other academic publications, because their thinking were that they were trained and employed as scientists with responsibility to research for the government and also to impart best practices to students and the general public and not to act as marketing executives.

The Kwame Nkrumah University of Science and Technology was the benchmark institution for all science and technology institutions in Ghana. Sadly, there seems to be gaps in the implementation of a management framework for managing the universities IP generated or acquired. Identifying the key staff involved in developing, maintaining and protecting IP of most of the focus institutions was a problem. This attested to the concern that most of the institutions do not prioritise IP/IPR management and also do not give much attention to how R&D is funded or financed, commercialization of R&D results / inventions, allocations of returns or benefit sharing, development of strategies for dealing with infringments,

creating awareness of legislative provisions on IP/IPRs and monitoring of institution's IP generated or acquired.

5.3. Conclusions

This study is very important and the reason is that it is to investigate the extent of implementation of IPM framework as a protection system in research and academic institutions in Ghana as they create and invent to generate IPRs. The study also sought to add to existing studies and knowledge in intellectual property management and policy implementation by investigating the extent of implementation of such practices where there are such systems and also to enhance the implementation where there are no such systems or management framework. This would serve as a way of promoting and ensuring originality in the new creations' inventions, new skills developed and also to create incentives for the owners and those involved in creation of the new invention.

5.4. Implications

There is a general consensus among policy makers that research and academic institution are tools for economic growth, specifically through the commercialization of the products of research and innovations. This can be achieved through the application of IP, IP management practices and the registration of the IP/IPRs to secure the inventive and commercial value of research. Because of commercialization of IP, innovations are becoming the part of major source of funding to many Research and Development institutions and it is therefore imperative that Ghanaian and African local institutions find their root to this course to bring development to the people.

5.5. Recommendation

From this study, the following recommendations are proposed, to the issues raised on the extent of implementation of effective intellectual property management framework by public-finance research and academic institutions in Ghana.

That the national authorities for IP consider granting incentives to the technology development and Technology Transfer Offices or Unit / Departments of the Ghanaian research and academic institutions especially the public funded ones.

There should be awareness creation on the available international, regional, national and institutional legislative provisions on IP/IPRs (especially on IP infringement, dispute resolution and commercialization).

There should be deliberate effort by the government to educate and sensitize the Ghanaian institutions both private and public and the general public on the country's IP system including IP Laws, Policies, Regulations and other national IP strategies.

The institutions with IP policies need to be educated and sensitized on what the policies seek to provide in relation to ownership, distribution, commercialization of the technology and innovations developed by the staff, students, researchers and other partner organizations conducting research with them.

The publicly funded research and academic institution need to educate their staff on IP, the institutions IP management strategies and the responsibilities of the staffs in that direction or to that effect.

5.6. Suggestions for Further Research

There seems to be a big gap in the understanding of the application of IP in most institutions in Ghana and African continent as a whole. A majority of the existing studies on the subject matter in Ghana focuses on the commercialization aspect of IP. Comparatively little analysis has been undertaken on the extent of implementation of IP management framework by publicly funded research and academic institutions in the country. According to this study almost all the institutions visited have some kind of offices and individuals dedicated to administer or lead the course of technology transfer and commercialization in the institution but on the application of IP and management of IPRs only few of them consider or practice it. Further research would be benefitial to improve on the situation in the publicly funded institutions as well as private instutions.

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APPENDICES

Appendix 1 :Questionaire for Institutional Data Collection

The sample Questionnaire for the institutional data collection for the study is what is shown below:

COLLEGE OF BUSINESS, PEACE, LEADERSHIP AND GOVERNANCE

INTELLECTUAL PROPERTY MANAGEMENT SYSTEM PROPOSED QUESTIONNAIRE

This Questionnaire is to collect data on implementation of Intellectual Property Management framework in Publicly-Funded Research and Academic Institutions in three (3) major regions in Ghana (Greater Accra, Ashanti and Eastern Region).

SECTION A: This information will enable the researcher to identify the institution and the respondent during the analysis. It will also enable the researcher to contact you in case of any further questions about the data.

Name of Region…….....….....

Name of Institution……..…….....

Type of institution…….....

Year of Establishment of the Institution…….

Principal activities of Institution/Organization…….....…….....

Contact of Institution……..…….....…….....

Name of Respondent…….....…….....

Title or Respondent……

Contact of Respondent…….

SECTION B: This information will enable the researcher to identify the IP owned by the institution (i.e. generated, or acquired IPs) and any available IP/IPR Management practices or policies.

a) Do your institution produce any form of Intellectual Property

i. Yes

ii. No

b) What kind of IP is generated in your institution?

i. Copyright

ii. Related rights

iii. Patent

iv. Industrial Designs

v. Geographical Indications

vi. Trade marks

c) Are you aware of any form of Intellectual Property (IP) legislation or Policies in the institution?

i. Yes

ii. No

d) If Yes, kindly mention those forms of Intellectual Property Legislation or Policies available in the institution.....

e) If No, what kind of Policy do the institution have for protecting its R&D outputs and other Intellectually owned IP Assets/Right (Describe)……...

f) What aspects among these four does the policy cover?

i. Disclosure to the institution of new IP to be protected

ii. Ownership of IP by the institution

iii. Ownership of IP by the researchers

iv. Benefit sharing with researchers upon commercialization

g) How is the Policy implemented in your institution.....

h) Which office is in charge of the administration of the Policy…….....

i) Does the institution a have Technology Transfer Office or any Office in charge of IP?

i. Yes

ii. No

j) If Yes, how many people have IP background.....

k) If No what office is in charge of IP.....

SECTION C: This information will enable the researcher to identify the availability and status of implementation of Intellectual Management Framework (IPM) framework in the institution.

a) Are you aware of any IP registration service offered by the institution?

i. Yes

ii. No

b) Do members of the institution understand IP related issues as it relates to the activities of the institution

i. Understand

ii. Do not understand

iii. Understand to some extent

c) Do members understand their obligations under the implementation or use of the IP Management framework?

i. Understand

ii. Do not understand

iii. Understand to some extent

d) Are Supervisors/Researchers at the institution aware of the institutions IP policies and IPR management practices in the institution

i. Yes

ii. No

iii. To some extent

e) Whom does ownership reside when intellectual property is made or created by staff, faculty and student or employee of the institution?

i. The institution

ii. The Staff

iii. The faculty

iv. Student

v. The individual employee

f) Are the employee and student involved in inventions entitled to share in revenue or incentives emanating from those inventions.?

i. Yes

ii. No

g) If yes, on what basis are the incentives shared?

i. Commission

ii. Based on a writing agreement.

iii. Lump sum payment

iv. Base on dividend

v. Top Up

vi. As part of salary payment

vii. Bonus

h) What are the other motivation/drivers for the implementation of the IP management system in your institution.....

SECTION D: This information will enable the researcher to identify the challenges and effect of implementation of IPM framework

a) How successful, in terms of percentages would you score the institution since the implementation of the IPM framework....…….....

i. very Successful

ii. Successful

iii. Good

iv. Average

v. Poor

b) What is the impact of the implementation of a framework for (IPM) management in your institution.....?

c) Are there any challenges with the institution in implementing a framework of IPM for managing its IPRs...…….....?

d) Is the guidelines for the IP registration process and procedures at the institution easy to understand.....

e) To what extent would be the impact of the IPM framework on the institution's activities and operations, …….....

f) What do you think would be a strategy to successfully implement the IPM framework or practices in your institution.....

Appendix2: AUREC Approval Letter

AFRICA UNIVERSITY
(A United Methodist-Related Institution)
INVESTING IN AFRICA S FUTURE

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320 Mutare, Zimbabwe, Off Nyanga Road, Old Mutare-Tel (+263-20) 60075/60026/61611 Fax: (+263 20) 61785 website: www.africau.edu

Ref: AU1917/21 23 February, 2021

Agyemang Badu EMMANUEL
C/O CBPLG
Africa University
Box 1320
Mutare

RE: IMPLEMENTATION OF A SYSTEM OF INTELLECTUAL PROPERTY RIGHTS MANAGEMENT BY PUBLICTECHNOLOGY TRANSFER ORGANIZATION(TTOS) IN GHANA

Thank you for the above titled proposal that you submitted to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following.

a) Research proposal
b) Data collection instruments
c) Informed consent guide

- **APPROVAL NUMBER** AU1917/21
  This number should be used on all correspondences, consent forms, and appropriate documents.
- **AUREC MEETING DATE** NA
- **APPROVAL DATE** February 23, 2021
- **EXPIRATION DATE** February 23, 2022
- **TYPE OF MEETING** Expedited
  After the expiration date this research may only continue upon renewal. For purposes of renewal, a progress report on a standard AUREC form should be submitted a month before expiration date.
- **SERIOUS ADVERSE EVENTS** All serious problems having to do with subject safety must be reported to AUREC within 3 working days on standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.

AFRICA UNIVERSITY
RESEARCH ETHICS COMMITTEE (AUREC)
APPROVED
P.O. BOX 1320, MUTARE, ZIMBABWE

Yours Faithfully

MARY CHINZOU – A/AUREC ADMINISTRATORFOR CHAIRPERSON, AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE

Appendix 3: Letter Seeking Authorization To Conduct Research In The Institutions Studied

Emmanuel Agyemang Badu
Ministry of Trade and Industry
MB 47, Ministries
Accra, Ghana
3/3/2021

REQUEST FOR ADMINISTRATION OF QUESTIONNAIRES

I am a final year student of the Africa University-AU in of Zimbabwe undertaking Masters program in Intellectual Property (MSc Intellectual Property).

As part of the requirement of the course, students are expected to complete a dissertation or project work of related topic to the course.

My dissertation is on institutional arrangement for the implementation of a framework/policy for managing Intellectual Property as it relates to the institution with regards to public academic and research institutions.

Your institution is selected as one of the focus institutions in the region for the studies, and I'm therefore seeking for your permission and assistance to administer the questionnaires in your institution.

The outcome of this studies is to be part of series of such assessment/studies by the Africa Intellectual Property Organization (ARIPO) and World Intellectual Property Organization (WIPO) who are the main organizer/sponsors of the program in Africa University (AU) and Kwame Nkrumah University of Ghana (KNUST).

Thank you

Yours Faithfully

Emmanuel Agyemang Badu
Senior Industrial Promotion Officer
Ministry of Trade and Industry-Ghana.